5. TRANSPORTATION IMPACTS OF THE PROPOSED ACTION

This chapter describes how the natural and human environment could be affected by the construction, operation, and decommissioning of transportation facilities in Skull Valley that route or transfer SNF shipped from U.S. reactor sites to the proposed PFSF. This chapter presents or references relevant data, describes the approach and methods used to predict future environmental effects, and presents an evaluation of the potential environmental impacts.

Each subsection describes, as appropriate, any potential impacts to specific categories of environmental resources. Each subsection also contains a concluding statement as to whether the potential impacts are judged to be small, moderate, or large. The standards used for these concluding statements are presented in the dialogue box on the following page. In addition to a discussion of the potential impacts, the possible mitigation measures that could be employed to eliminate or reduce the magnitude of any impacts are also presented and discussed within each subsection. Each subsection identifies certain of the possible mitigation measures that the cooperating agencies recommend be required. See Section 9.4.2 for a complete list of the mitigation measures that the cooperating agencies recommend be required.

This chapter discusses the impacts of cross-country transportation of SNF (i.e., transporting SNF from U.S. reactor sites) to the proposed PFSF in Skull Valley. PFS member utilities, and possibly utilities that are not members, located throughout the United States could ship SNF to the proposed PFSF. This SNF would eventually be shipped from the proposed PFSF to a permanent repository. Section 2.1.2.1 provides an overview of the transportation activities associated with the proposed action. Most U.S. nuclear power plants are located in the eastern part of the country, and SNF shipment from these reactors to the proposed PFSF would traverse a number of states. Therefore, the environmental impacts associated with cross-country transportation are considered in this DEIS. Because of the size and weight of the SNF shipping casks included in the PFS license application, shipment by rail is the only viable cross-country transportation option. Therefore, the focus of the cross-country transportation analysis in this chapter is on rail transportation.

In addition to cross-country transportation of SNF, this chapter also addresses the impacts of constructing and operating transportation facilities in Skull Valley. The proposed action would include the construction of a new rail siding at Skunk Ridge and a new rail line leading to the Reservation. An alternative method of local transportation is also addressed in this DEIS: the construction of an ITF near Timpie and the use of heavy-haul vehicles on Skull Valley Road. Both the proposed action and the ITF alternative are addressed in this chapter. Decommissioning of the proposed transportation facilities, including rail line abandonment, is also discussed in this chapter. This discussion is based on currently available information; those agencies responsible for transportation facility decommissioning will address that action with further NEPA documentation when those facilities are decommissioned.

Transportation of nuclear materials, including SNF is regulated by both the U.S. Department of Transportation (DOT) and the NRC. The safety of SNF shipments with respect to radiological impacts, especially in the event of a transportation accident, is ensured, in large measure, by the casks that contain the SNF. These casks must meet performance requirements specified in 10 CFR Part 71 and their design must be certified by the NRC.

Other elements of safety are provided for by the DOT's operating requirements for vehicles and drivers. These operating requirements are defined in various parts of 49 CFR.

The Surface Transportation Board (STB) thresholds for environmental analysis are contained in 49 CFR Part 1105. STB's environmental analysis of a proposed rail line covers two broad areas of impact: construction and operation. Construction-related impacts are evaluated for all new rail line constructions. Operation-related impacts are generally evaluated if the volume of traffic generated by the proposed construction exceeds STB's established thresholds.

STB's thresholds for analysis relate to both the number of trains per day and to gross ton-miles to be carried annually by the proposed rail line. Proposed rail line construction that would result in an increase of eight or more trains per day or at least a 100 percent increase in the gross ton-miles carried by the rail line would trigger the need for environmental analysis of operational impacts. Areas currently in non-attainment of Federal Air Quality Standards are subject to a stricter threshold: three trains per day, or a 50 percent increase in gross ton-miles carried.

The proposed PFS rail line would not exceed either of these STB thresholds. However, because of the hazardous nature of the cargo to be carried on the line, STB is considering potential environmental impacts along the proposed rail line and along railroad mainlines. This environmental review includes potential impacts from incident-free shipping, as well as from potential freight accidents and possible subsequent release of radioactive material.

DETERMINATION OF THE SIGNIFICANCE OF POTENTIAL ENVIRONMENTAL IMPACTS

A standard of significance has been established by NRC (see NUREG-1437) for assessing environmental impacts. With the standards of the Council on Environmental Quality's regulations as a basis, each impact is to be assigned one of the following three significance levels:

- ***Small***. The environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource.
- ***Moderate***. The environmental effects are sufficient to alter noticeably, but not to destabilize, important attributes of the resource.
- ***Large***. The environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource.

5.1 Geology, Minerals, and Soils

5.1.1 Construction Impacts

The environmental impacts to soils and geologic resources would include the loss of a portion of the soils resource, due to its physical alteration during construction, and access restrictions to economic geologic resources located beneath the proposed transportation facilities and their corridors. These alterations lead to a reduction in the soils' ability to support plant and animal life, and may possibly lead to changes in windborne erosion patterns, changes in surface water drainage and erosion patterns, and changes in infiltration characteristics. The impacts to land use and the loss of vegetation and habitat are described in Sections 5.4 and 5.5, windborne erosion impacts in

Section 5.3, surface water drainage and water erosion impacts in Section 5.2, and infiltration impacts in Section 5.2. As discussed below, impacts to the loss of the soils resource and to economic geologic resources would be small.

The assessment for the loss of the soils resource compares the amount of soil to be lost in the construction of the proposed rail siding and the new 51-km (32-mile) rail line with the amount of similar soils resources available in Skull Valley. The assessment of impacts to economic geologic resources (e.g. aggregate) compares the estimated amount of materials required for construction with the availability of those resources in the area. It also considers the impacts to mineral resource exploitation in the immediate area of the proposed PFSF.

5.1.1.1 New Rail Line from Skunk Ridge

The existing soil profile would be altered during construction activities. PFS reports that approximately 95,600 m^3 (125,000 yd^3) of excess material would be generated from surface stripping operations in rail line construction, which would be used to stabilize side slopes (PFS/RAI2 1999). As discussed in Section 2.1.1.3, additional excess material [up to a total of 96,000 m^3 (256,000 yd^3), including the 95,600 m^3 (125,000 yd^3) from surface stripping operations] could also be generated. The estimated amount of spoil generated in rail construction is expected to be reduced during final design, but any excess material would be used as embankment dressing. Thus, there would be no impacts to any potential off-site fill areas or disposal sites. Soils used as slope and embankment dressing could be recoverable upon site decommissioning; thus, the soils resource would not be permanently lost. Impacts to the loss of the soils resource are therefore small.

Table 5.1 compares the amount of construction materials required in rail siding and rail line construction with the amount of material available in the area (see Section 3.1.4). The amount of sub-ballast required [172,000 m^3 (225,000 yd^3)] constitutes nearly 60 percent of the material available from the private sources identified by PFS [300,000 m^3 (393,000 yd^3)]. This would leave sufficient aggregate material available for other uses because five other locations on BLM land exist where additional materials are available. A much smaller fraction (only 17 percent) of the ballast available from the private sources would be used for construction of the rail line. Thus, impacts to these economic geologic resources would be small. Mineral resources located beneath the rail siding and rail line would be unavailable for exploitation during construction. However, the impacts from this unavailability would be small due to the wide availability of similar minerals in the region.

5.1.1.2 New ITF Near Timpie

The existing soil profile would be altered during construction activities. PFS reports that approximately 7,100 m^3 (9,300 yd^3) of excess soil (spoil) would be generated from stripping operations in ITF construction, which would be used as slope dressing (PFS/RAI2 1999). Soils used as slope dressing could be recoverable upon site decommissioning; thus, the soils resource would not be permanently lost. Impacts to the loss of the soils resource are therefore small.

Table 5.1 compares the amount of construction materials required for ITF construction with the amount of material available from the private sources identified by PFS. Less than 1.5 percent of the materials available from the private sources would be needed to build the ITF. Because most of this material could be recovered upon site decommissioning, impacts to these economic geologic resources would be small.

Table 5.1. Comparison of transportation facility construction material requirements with quantities of materials commercially available in the vicinity of Skull Valley

Material type	Material required	Material available
Rail corridor from Skunk Ridge		
Sub-ballast	172,000 m^3 (225,000 yd^3)	300,000 m^3 (393,000 yd^3)
Ballast	73,000 m^3 (95,700 yd^3)	438,000 m^3 (572,000 yd^3)
Intermodal Transfer Facility		
Sand	880 m^3 (1,150 yd^3)	300,000 m^3 (393,000 yd^3)
Crushed rock	1,200 m^3 (1,600 yd^3)	465,000 m^3 (607,000 yd^3)
Small road base	500 m^3 (650 yd^3)	300,000 m^3 (393,000 yd^3)
Large road base	2,300 m^3 (3,000 yd^3)	300,000 m^3 (393,000 yd^3)
Subballast	4,100 m^3 (5,400 yd^3)	300,000 m^3 (393,000 yd^3)
Ballast	3,300 m^3 (4,300 yd^3)	438,000 m^3 (572,000 yd^3)
Structural fill	2,000 m^3 (2,700 yd^3)	300,000 m^3 (393,000 yd^3)

Mineral resources located beneath the ITF would be unavailable for exploitation during construction. However, the impacts from this unavailability would be small due to the wide availability of similar minerals in the region.

5.1.2 Impacts During Operations

5.1.2.1 New Rail Line from Skunk Ridge

Once the Skunk Ridge rail siding and rail corridor have been constructed, there would be no further impacts to soils or mineral resources during the operational phase of transporting SNF to the proposed PFSF. Extraction of subsurface mineral resources would not be permitted during operation; these resources, if any, would therefore be unavailable during the operational period. As explained above, the impacts from the unavailability of these resources would be small.

5.1.2.2 New ITF Near Timpie

Once the ITF has been constructed, there would be no further impacts to soils or mineral resources during the operational phase of transporting SNF to the proposed PFSF. Extraction of subsurface mineral resources would not be permitted during operation; these resources, if any, would therefore be unavailable during the operational period. As explained above, the impacts from the unavailability of these resources would be small.

5.1.3 Impacts at the Alternative Site B

5.1.3.1 New Rail Line from Skunk Ridge

As discussed in Section 5.1.1 above, impacts to the soils resource or to economic geologic resources would be small. Even though the rail line to Site B would be approximately one mile longer than to Site A and would involve about 10 ha (24 acres) of additional land, the impacts to the soils or economic geologic resources would not differ significantly from those for Site A.

5.1.3.2 New ITF Near Timpie

As described in Section 5.1.2, once the ITF has been constructed, there would be no further impacts to soils or mineral resources during the operational phase of transporting SNF to the proposed PFSF. This conclusion would apply to the proposed facility located at either Site A (i.e., the proposed site) or the alternative site (Site B).

5.1.4 Mitigation Measures

5.1.4.1 New Rail Line from Skunk Ridge

Soils (spoils) used during construction of the rail line from Skunk Ridge for slope dressing could be recoverable upon facility decommissioning and therefore are not lost. Economic geologic resources (e.g. aggregate) used in construction are similarly recoverable. Based on this assessment of the impacts to soils and economic geologic materials, no mitigation measures were identified that would appreciably reduce the effect to these resources.

5.1.4.2 New ITF Near Timpie

Similar to the new rail line, soils and aggregate materials are recoverable upon facility decommissioning, and no mitigation were identified that would appreciably reduce the effect to these resources.

5.2 Water Resources

Transportation facilities that may be constructed in association with the proposed PFSF include the 51-km (32-mile) long rail line along the western edge of Skull Valley and the ITF near Timpie. This section discusses potential hydrological impacts that could result from construction and operation of these two transportation options.

5.2.1 Construction Impacts

5.2.1.1 Surface Water

This section discusses potential impacts to the surface water system from transportation facility construction, including potential effects of channel modifications and potential impacts of flooding during construction. Pursuant to 40 CFR 122.26(b)(14) PFS would be required to obtain a UPDES permit to protect surface waters from pollutants that could be conveyed in construction-related storm water runoff and would be required to prepare a Stormwater Pollution Prevention Plan because the construction of the rail line would disturb more than 2 ha (5 acres).

New rail line from Skunk Ridge. As discussed below, potentially small impacts related to surface water could occur from construction of the rail line from Skunk Ridge. The rail line would be constructed along a route near the base of the Cedar Mountains along the western edge of Skull Valley. The rail route would cross approximately 32 arroyos that would require the installation of 110 culverts (PFS/ER 2000). During construction, soils in and around the channel crossings would be disturbed temporarily and could lead to increased erosion and siltation in the vicinity of the construction site during periods of rainfall or snowmelt. Use of BMPs during construction, as planned by PFS, would control erosion and siltation during construction under normal weather conditions for the area. Potential impacts under flood conditions during construction are discussed in a later section. BMPs for erosion control measures would mitigate the potentially small impacts related to surface water along the rail line during construction.

New ITF near Timpie. Potential impacts to the surface water system related to construction of the ITF would be small because the facility would have no interaction with the surface water system. The ITF would be located approximately 2.9 km (1.8 miles) west of Timpie in the area north of I-80 and south of the mainline railroad. The site occupies a small elevated area with no surface water drainage channels crossing the area. Construction activities would result in stock piles of disturbed soil that would lead to increased erosion, siltation, and sediment under normal weather conditions. Construction BMPs would be capable of controlling erosion and siltation of adjacent areas. Pursuant to 40 CFR 122.26(b)(14), stormwater runoff from the proposed ITF construction site would be controlled under a general permit (i.e., UPDES) with the State of Utah. The UPDES permit is required because the construction of the ITF would disturb more than 2 ha (5 acres) (see Section 1.6.2.3).

Impacts to surface water quality. Potential impacts to surface water quality from construction of the transportation facilities would be small. Foreseeable effects on surface water quality during construction include (1) a spill of vehicular fuel into a surface water channel that contained flowing water, (2) the possible presence of motor oils and grease from construction equipment, and (3) a possible increase in sediment that could affect the quality of surface water runoff from the construction sites. The potential for a spill into a flowing surface water channel along the rail line is considered low because the flow channels involved along the rail line are dry arroyos for much of the year. The potential for surface channel contamination to occur at the ITF site is nearly nonexistent because no surface water flow channels cross the site. In any event, runoff from the rail line or ITF would be controlled under the UPDES permit.

5.2.1.2 Potential Impacts of Flooding

This section discusses potential impacts from flooding during construction, should such an event occur.

New rail line from Skunk Ridge. Potential impacts from flooding during construction of the rail line could be moderate, but the probability of such an occurrence is low. In the event that severe storms occurred during construction activity, there could be erosion of soil from the railroad embankment with consequent redeposition of soil in the downstream channels. Although PFS would use construction BMPs, a severe flood could overwhelm the capability of standard practices to control surface water flows in arroyos draining the Cedar Mountains. The severity of such an impact would vary with the storm intensity. Should severe flooding occur (i.e., storms associated with the 100-year flood event or greater), the eroded materials from the construction site would be commingled with natural sediment transported in the flood flows from areas adjacent to the rail line. The eroded material from the construction site would not cause a significant increase in impacts beyond those caused by natural sediment transport resulting from such an event.

New ITF near Timpie. The ITF would be on a slight topographical rise, approximately 2.9 km (1.8 miles) west of Timpie in the area north of Interstate 80 and south of the existing mainline railroad. The existing elevation of the ITF project area is from 1286.6 to 1288.1 m (4220 to 4225 ft). The ITF itself would be designed nearer the 1289 m (4225 ft) elevation. In 1986 the Great Salt Lake flooded to an historic elevation of 1284.1 m (4211.85 ft), which is well below the ITF area elevation. In addition, the Great Salt Lake Planning Project Draft Analysis of Proposed Management Alternatives, issued by the State of Utah Department of Natural Resources in January 1999, has designated the flood plain of the lake at 1284.15 m (4212 ft) for planning purposes and 1285.7 m (4217 ft) as the extent of the lake's floodplain (PFS/RAI2 1999e). Neither elevation is above the ITF design elevation.

Intense precipitation events could result in increased stormwater runoff at the ITF construction site. This could result in excessive waterborne erosion of spoil piles or piles of construction aggregate. Otherwise, potential flood-relate impacts during construction of the ITF would be small because the facility would be constructed in an area with little to no flooding potential. This stormwater would be controlled under a general permit with the state of Utah (see Section 1.6.2.3).

5.2.1.3 Water Use

This section discusses the water use and potential impacts related to construction of the transportation facilities.

New rail line from Skunk Ridge. Potential water use impacts related to construction of the rail line would be small. Construction of the rail line would require approximately 625 m^3/day (165,000 gal/day) of water during the 15-month construction period [totaling approximately 242,267 m^3 (64 million gallons)] for dust control and to provide water for soil compaction (PFS/ER 2000). This water would be acquired from an offsite source and trucked to the site. As discussed in Section 4.2, PFS has determined that at least one private source of water exists from which water of the required quantity and quality could be purchased to support project construction. Use of water from private supplies would not adversely affect water availability in the area. Water required for concrete culvert construction would be a small volume compared to the overall project water requirement (PFS/ER 2000). Bottled drinking water from offsite sources would be provided for construction workers. Drinking water for personnel during operation would be provided from the PFSF.

Additional quantities of water would be required for the planned revegetation of disturbed areas along the rail corridor. The volume of water needed is dependent upon the method used to revegetate the area. The water requirements will be determined during the development of a final revegetation plan. Therefore, no estimate is available at this time as to how much water would be needed for this purpose. The criteria that would need to be implemented to ensure successful revegetation are described in Section 4.4.5.

New ITF near Timpie. Potential impacts related to water use from construction of the ITF would be small. Water required for dust control during construction of the ITF is estimated by PFS to be approximately 71 m^3/day (18,800 gallons/day) during the construction period and the water would be acquired from offsite sources and trucked to the site. The construction period for the ITF would be approximately 1 year, and the maximum water volume that would be used during this period, based on the available information, would be about 21,200 m^3 (5.6 million gallons). As discussed in Section 4.2, PFS has determined that at least one private source of water exists from which water of the required quantity and quality could be purchased to support project construction. Use of water from private supplies would not adversely affect water availability in the area. Concrete for the gantry crane foundation would be mixed at the batch plant at the proposed PFSF site and water required for this concrete [about 9 m^3/day (2,400 gal/day)] would be obtained at the proposed PFSF site.

5.2.1.4 Groundwater

Potential impacts that could occur to groundwater are expected to be small as a result of construction of the transportation facilities. Groundwater could be affected by stormwater runoff from the site during construction; however, the proposed construction activities would not increase the quantities of runoff. The presence of motor oils and greases from construction equipment, as well as increased sediment, could affect the quality of the runoff, but because small quantities of runoff would be involved, the overall impacts to groundwater quality would be small.

The only foreseeable event that could impact groundwater quality during construction of the rail line or the ITF would be a large accidental spillage of vehicular fuel used by construction equipment for which no mitigative cleanup actions were taken. A large fuel spill would be required to adversely impact groundwater quality at the site because the groundwater table is approximately 39 m (125 ft) below the ground surface and soil retention would hold up the liquid. Furthermore, such spills could be mitigated through implementation of BMPs to clean them up before water quality impacts occur. PFS's current list of BMPs (see Section 2.1.4) does not include a specific commitment concerning spill response.

5.2.2 Impacts During Operations

5.2.2.1 Surface Water

This section discusses potential impacts related to surface water from operation of the transportation facilities including those that would be expected under normal climatic conditions and potential impacts related to flooding.

New rail line from Skunk Ridge. Under normal weather conditions, the potential impacts related to the surface water hydrological system from operation of the rail line would be small. Small local changes in the flow channels would have occurred as a result of construction of the rail corridor and its associated culverts. These culverts would be sized and aligned so as to minimize the significance of any changes to the natural drainage channels. During operation of the rail line, these culverts would intermittently carry water from rainfall and snowmelt. Under normal weather conditions in the area, some sediment accumulation upstream of the culverts could occur after stormflow events, altering channel morphology. Downstream scour would be minimized through use of rip-rap at sites where rapid flow velocities would occur at culvert outlets. PFS's design packages include criteria that specify flow velocity thresholds that require rip-rap to be placed at culvert outlets. Under normal conditions, these features would prevent erosion downstream of the culverts. PFS designed culverts along the corridor to carry the precipitation from a 100 year flood event (Donnell 1999). The use of energy dissipating rip-rap at culvert outlets is a mitigating measure that has been incorporated into the design of the rail access route.

New ITF near Timpie. Under normal weather conditions, the potential impacts related to operation of the ITF would be small because all activities would occur inside a building and there would be no interaction with surface water. During operation of the ITF, stormwater runoff from the site would be controlled. Because of the types of impervious surfaces (i.e., buildings, asphalt, concrete) at the proposed ITF, runoff quantities would be expected to increase at the site. Also, the potential presence of motor oils and grease from vehicles could result in a degraded quality of this runoff as compared to what exists at the site now.

Impacts to surface water quality. Potential surface water quality impacts related to operation of the transportation facilities would be small. No permanent surface water bodies exist near the transportation facilities and therefore, under normal weather conditions, there would be no potential for impact to perennial surface water features. Seasonal surface water flows would occur along the rail line and an accidental spill of locomotive fuel near one of the channel crossings could occur but would be an unlikely event. Should such a spill occur during a season when surface water was present in channels along the rail route, emergency response could intercept and clean up the spill, contaminated surface water, and contaminated soils to mitigate the incident.

5.2.2.2 Potential Impacts of Flooding

This section describes the potential impacts to the hydrologic water system related to the transportation facilities that could result from flooding.

New rail line from Skunk Ridge. Potential impacts that could occur to the surface water system along the rail line in the event of major flooding would be small. The presence of the rail line is not expected to increase flooding downstream but may slightly reduce peak flows downstream during high flows because of temporary pooling of water upstream of culvert inlets. PFS's design for culverts at arroyos along the rail line would accommodate flows up to and including those expected in a 100-year flood without overtopping the embankment. The design incorporates rip-rap to prevent or minimize erosion and scour below culvert outfalls under high flow conditions.

Flows in excess of the 100-year flood could result in overtopping of the railroad embankment at one or more locations. Such an event would possibly erode a portion of the embankment and could contribute to downstream siltation. Such a severe flood could also be accompanied by mudflows or debris flows from the upper arroyos in the Cedar Mountains. Mudflows or debris flows would likely plug the culverts and would accumulate in the area upstream from the railroad embankment. Large flows could cover the railroad and block rail access to the PFSF site until their removal. This potential event is considered to have a low impact, because it would be a natural event and would not be triggered by the presence of the rail line. If such an event occurred, there would be abundant natural damage in the area and the incremental contribution from material eroded from the railroad embankment would be minor in comparison to the naturally derived flood debris.

Similarly, culvert blockage could result from windblown debris (such as tumbleweed); however, if PFS conducts appropriate maintenance of the culverts along the rail line, this impact could be minimized. This maintenance should include periodic inspection and clearing of any obstructions within the culverts.

New ITF near Timpie. Potential impacts related to flooding at the ITF during operation would be small and would be similar to those described in Section 5.2.1.2 for the construction of the facility.

5.2.2.3 Water Use

Potential water use impacts during operation of the transportation facilities would be small. Water use during operation of the rail line would be limited to drinking water for personnel. Bottled water from the proposed PFSF would be provided to the workers. The incremental consumption of water by rail crew members would not have an adverse impact on water availability.

During operation of the ITF, water would be used for drinking and restroom facilities. Water needed during operation of the ITF would be obtained from a local commercial water supplier. Due to the small number of workers (approximately 9–11 people), acquisition of water from a commercial source would not have an adverse impact on water availability.

5.2.2.4 Groundwater

Any potential impacts to groundwater that would occur during operation of either the rail line or the ITF would be small because no groundwater is proposed for use. Accidental spillage of fuel could contaminate soil at some location along the rail corridor. However, this is unlikely because refueling activities would be limited to the rail siding. A spill response action could be taken to prevent any impact to groundwater from such an event. PFS's current list of BMPs (see Section 2.1.4) does not include a specific commitment concerning spill response. During operation of the ITF there is little potential for such releases to impact groundwater quality because the primary activity would be the transfer of SNF casks from railcars to heavy-haul vehicles. The nature of the proposed ITF activities is not likely to cause accidental spills.

5.2.3 Impacts at the Alternative Site (Site B)

Construction and operation of either the rail line or ITF with the proposed PFSF at Site B would produce impacts to surface water and groundwater that would be similar to those of a facility located at Site A. These impacts are described above.

5.2.4 Mitigation Measures

Potential impacts to water quality could occur if a significant accidental vehicular fuel spill occurred during the wet season or if spills occurred but were not cleaned up. An SPCC plan for the rail line or ITF similar to the SPCC plan required for the site (see Section 1.6.2.1) would prescribe methods for minimizing or eliminating the potential impacts from spills. The cooperating agencies recommend that PFS be required to develop a SPCC plan for the proposed rail line or ITF (see Section 9.4.2). To keep the rail line culverts free of windblown debris, PFS should develop a maintenance plan to periodically check them for debris and clean them as necessary. Such a plan will ensure the rail line culverts function as designed and stream flow alterations are minimized. The cooperating agencies recommend this mitigation measure be required (see Section 9.4.2).

5.3 Air Quality

5.3.1 Construction Impacts

As discussed below, the temporary and localized effects of construction could produce occasional and localized moderate impacts on air quality in the immediate vicinity of the construction activity, and small impacts elsewhere. Air quality impacts of operations would be small.

During construction of either the proposed Skunk Ridge rail corridor or the ITF near Timpie, temporary and localized increases in atmospheric concentrations of nitrogen dioxide (NO_2), carbon monoxide (CO), sulfur dioxide (SO_2), volatile organic compounds (VOCs), and particulate matter would result from exhaust emissions of workers' vehicles, heavy construction vehicles, diesel generators, and other machinery and tools. Particulate matter in the form of fugitive dust emitted from excavation and earthwork would lead to local increases in atmospheric concentrations of PM-10 where construction occurs near Interstate 80. As would be the case for construction of the proposed PFSF (see Section 4.3.1), fugitive dust would be the primary source of impact to air quality during construction of either the proposed Skunk Ridge rail corridor or the ITF near Timpie.

As discussed below, construction of new rail sidings at either Skunk Ridge or Timpie could produce temporary airborne concentrations that exceed the 24-hour PM-10 standard along segments of Interstate 80 that pass near the construction area(s). Such airborne concentrations often occur near road construction areas that involve appreciable excavation/earthwork. Airborne dust in road construction areas can sometimes affect visibility. While such dust is usually not sufficient to create a safety hazard, it can cause annoyance and inconvenience. These types of impacts are discussed below, along with their applicable mitigation measures.

5.3.1.1 New Rail Line from Skunk Ridge

A new rail siding (see Figure 2.4) would be constructed at Skunk Ridge to connect a proposed new rail line with the existing Union Pacific main line. The preferred route for the new rail line would begin near Skunk Ridge and proceed eastward, roughly paralleling Interstate 80, for about 5 km (3 miles) before proceeding southward to a location due west of the proposed PFSF site (see Figure 1.2). From there it would proceed eastward to an area just south of the proposed storage pads (see Figure 2.2). The area of greatest potential PM-10 impact is considered to be along the northern end of the proposed rail line where it would run parallel to Interstate 80. Impacts at that location would be analogous to those from typical road construction, where members of the general public could be exposed to high PM-10 concentrations for brief periods as their vehicles pass through the construction area.

To obtain an upper-bound estimate of PM-10 impact from the construction of the new rail line, a total area of about 24 ha (60 acres), about 5 km (3 miles) long and 50 m (164 ft) wide, was assumed to be simultaneously undergoing heavy construction. Assumptions regarding emissions per unit area and work schedule were the same as those for the analysis of the proposed PFSF construction discussed in Section 4.3. The same model used for modeling effects of site construction [i.e., ISCST3 (EPA 1995)] was applied to obtain the air-quality impacts. The highest modeled PM-10 concentrations along the roadway would occur when the wind is from the west; however, there are no large nearby sources in that direction that would add appreciably to the maximum PM-10 concentrations resulting from construction of the new rail sidings or rail line (e.g., the Magnesium Corporation of America is in a different wind direction). When modeled maximum concentrations from construction of the rail siding and rail line were added to background values to obtain cumulative impacts, the results indicated that the 24-hour NAAQS standard could occasionally be exceeded along portions of the 3-km (2-mile) segment of Interstate 80 nearest to the proposed construction area. It is unlikely that NAAQS (see Section 4.3) would be exceeded at other locations along the highway, including any location near Low or Delle. These temporary and localized effects of construction would be expected to produce occasional and localized moderate impacts on air quality in the immediate vicinity of the construction activity, and small impacts elsewhere. These effects can be mitigated to acceptable levels by dust control measures, such as surface wetting, and by restricting the area under construction at any one time to less than 5 ha (12.5 acres).

5.3.1.2 New ITF Near Timpie

For the proposed ITF (see Figure 2.14), the largest area that would be under construction at any one time was taken as about 4.5 ha (11 acres). The ISCST3 air dispersion model (EPA 1995) and assumptions similar to those used in the analysis of construction of the proposed PFSF and the proposed rail line were applied to the analysis of air quality impacts from this construction. As in those analyses, construction impacts were added to background values of PM-10 concentrations to obtain cumulative impacts. On some days during construction, particulate concentration could exceed the 24-hour PM-10 standard along as much as 650 m (about 0.4 miles) of Interstate 80. If the 24-hour PM-10 standard were briefly exceeded, the location of the stretch of highway affected would depend on wind direction. No airborne concentrations exceeding the annual NAAQS standard would be expected along Interstate 80, even if no mitigation (e.g., sprinkling with water) were applied. These temporary and localized effects of construction are expected to produce occasional and localized moderate impacts on air quality in the immediate vicinity of the construction activity, and small impacts elsewhere. These effects would be mitigated by dust control measures, such as surface wetting.

5.3.2 Impacts During Operations

5.3.2.1 New Rail Line from Skunk Ridge

The types of air quality impacts expected from operation of a rail line are the same as those for the operation of a switchyard locomotive; NO_2, SO_2, PM-10, and CO would be emitted from the locomotive as it passes. However, rail-line impacts would be smaller because locomotives using the rail line would only emit pollutants in one area for a very short period before passing on, while the switchyard locomotive would be operating within the confined area of the switchyard. The analysis of a switchyard locomotive, presented in Section 4.3, provides an upper bound on air-quality impacts of rail line operation. Because the effects of a switchyard locomotive would be expected to be small, air quality impacts associated with operation of the rail line would also be expected to be small.

5.3.2.2 New ITF Near Timpie

Air quality impacts expected from operation of transport vehicles are typical of those from combustion engines used to power locomotives and construction equipment, diesel generators, etc. Emissions of NO_2, SO_2, PM-10, and CO would occur from operation of the ITF, and effects of these pollutants are discussed in Section 4.3. Effects of the ITF operation on long-term air quality would be small because of the infrequent occurrence of cask transfer. Short term effects would involve emissions that would not add appreciably to those from vehicles routinely using Interstate-80. Impacts from the operation of the ITF near Timpie are, therefore, expected to be small.

5.3.3 Impacts at the Alternative Site B

5.3.3.1 Construction Impacts

Site B would be slightly farther than Site A from Interstate 80 and from the nearest existing rail line. This would increase the length of a rail line to the proposed facility by about 2 percent, and would increase the construction activity by a proportionate amount. In addition, the length of travel for construction materials and personnel would also increase during the additional construction. However, this would not be expected to increase the traffic density. The additional distance would not increase the significance of the associated air-quality impacts, which would be small in either case.

5.3.3.2 Impacts During Operations

Site B would be slightly farther than Site A from Interstate 80 and from the nearest existing rail line. This would increase emissions from transportation by an additional 1.6 km (1 mile) or around 2 percent of the distance to the proposed PFSF. Ambient-air concentrations of pollutants along the road or rail line would not be noticeably different; but those routes and associated emission points would extend about 1 km (3,300 ft) farther. This extension would not change the significance level of the air quality impacts, which would be small in either case.

5.3.4 Mitigation Measures

The mitigation measures described in Section 4.3.4 for construction and operation of the proposed PFSF would also be applicable to the proposed transportation facilities in Skull Valley. However, because of the proximity of transportation facility construction to Interstate-80 and the large number of individuals on Interstate-80 who could be exposed to fugitive dust from the construction site, additional mitigation measures are warranted. These measures are described below.

5.3.4.1 Construction Impacts

Air quality impacts from construction of the proposed rail line or ITF would mainly involve fugitive dust resulting from earthmoving activities. Routine sprinkling of disturbed surfaces with water when winds are blowing toward Interstate 80 would reduce human exposure to airborne particulate matter. The application of surfactants or surface crusting agents would also be effective in reducing dust emissions from construction areas. Minimizing the size (i.e., acreage) of active construction areas and/or installing barriers to shield active construction areas from the wind are two additional measures that would reduce the total amounts of dust emitted. The cooperating agencies recommend that PFS be required to develop a program to control fugitive dust during construction (see Section 9.4.2). The program should include one or more of the methods described above.

5.3.4.2 Impacts During Operations

Impacts of operations at the proposed PFSF site, an ITF, and a rail line are similar; all involve small emissions of air pollutants from fossil-fuel combustion. Impacts would be small and could not be reduced appreciably by additional mitigation measures, such as enhanced vehicle emission controls or extensive power engine maintenance campaigns.

5.4 Ecological Resources

The potential impacts on ecological resources of site preparation, construction, and operation of facilities for transporting SNF to the PSF site are evaluated and discussed in this section. Areas of potential concern include construction and operation activities that would disturb or remove vegetation, animals, and wetlands either temporarily or permanently. Direct losses from land disturbance are quantified by determining the amounts of habitat lost as a result of construction activities. Potential impacts on species of special concern, as identified in Section 3.4.3, that are found to reside on or use the areas necessary for the transportation facilities are also evaluated.

Construction and operation of the proposed transportation facilities may create impacts to wildlife including mammals, birds, and nesting raptors. With the implementation of appropriate mitigation measures, impacts as a result of the Skunk Ridge rail line are expected to be small for all these species. If the heavy haul truck transportation alternative were chosen, much less habitat for these species would be disturbed, and, therefore, would also result in small impacts.

5.4.1 Construction Impacts

5.4.1.1 Vegetation

Direct impacts from construction would include clearing existing vegetation and modification of wildlife habitat. Some of the area to be cleared would be covered by the rail line and rail siding at Skunk Ridge; part of the cleared area would be revegetated. None of the area to be cleared at the ITF near Timpie would be revegetated. In addition, fugitive dust from construction could have indirect effects on vegetation. Construction of the rail corridor or ITF near Timpie is expected to have only a small impact on vegetation and would have a beneficial impact (due to the use of native species) along the Skunk Ridge rail line corridor when revegetation occurs following construction.

Table 2.4 presents the amount of land that would be cleared for each of the transportation alternatives. Construction of the Skunk Ridge rail line corridor, the preferred transportation alternative, would require clearing vegetation and grading soil from a total of 314 ha (776 acres) to reach the preferred site (Site A). For this option approximately 63 ha (155 acres) of desert shrub/grass vegetation would remain cleared for the life of the facility; the remaining cleared area (251 ha [621 acres]) would be replanted following construction primarily with native vegetation. For the heavy-haul truck option the area to be cleared would be 4.5 ha (11 acres) for the ITF near

Timpie, none of which would be revegetated. The area to be used for the ITF is the location of the existing Union Pacific rail line, and, as such, it is previously disturbed; hence, any construction activities in that area would have only a small impact on native vegetation.

There are no unique habitats that would be cleared for either the ITF near Timpie or the Skunk Ridge rail corridor. Much of the vegetation that would be cleared includes non-native species such as cheatgrass. Most of the land that would be cleared for the Skunk Ridge rail line corridor would be replanted with native vegetation following construction. The revegetation plan would be similar to that discussed in Section 4.4.1. A detailed revegetation plan would be developed in consultation with BLM during construction (PFS/RAI2 1999). A seed mixture that could be used for revegetation is listed in Table 5.2. The revegetation plan would comply with the latest BLM guidelines on revegetation in effect at that time for details such as soil preparation, type of seed mix, fertilizing, time of year to plant, and watering frequency.

Table 5.2. Seed mixture for rehabilitation of the area cleared for the rail line

Scientific name	Common name	Planting rate kg/ha (lb/acre)
Elymus smithii	Western wheatgrass	3.6 (3)
Stipa hymenoides	Indian rice grass	2.4 (2)
Linum lewisii	Lewis (or blue) flax	1.2 (1)
Atriplex canescens	Four winged saltbush	0.6 (0.5)
Kochia prostrata	Prostrate Kochia (prostrate summer cypress)	0.6 (0.5)

Fugitive dust would be generated during construction, as discussed in Section 5.3. The small, short-term, incremental amount of dust that would be generated from construction activities is expected to only have a small impact on vegetation since vegetation growing in such environments is not sensitive to dust.

5.4.1.2 Wildlife

During the construction of the proposed transportation facilities, wildlife, such as ground squirrels, kangaroo mice, and small reptiles could be displaced or lost due to the excavation of soils. There would be a loss of nest sites for certain species of birds and burrow sites for species such as gophers and burrowing owl. This reduction of animals and wildlife habitat would have a slightly negative impact on the abundance of prey for predatory species, such as hawks, eagles, owls, and fox species. However, the permanently disturbed area is expected to have only a small negative impact on available wildlife habitat. Even when considering the longest rail line route to Site B, less than 0.3 percent of Skull Valley would be disturbed due to the construction of the railroad corridor. If the heavy haul truck alternative was chosen, the amount of habitat disturbance would be reduced to less than 0.01 percent of Skull Valley, as only the ITF area would require clearing [approximately 4.5 ha (11 acres)].

Because wildlife in Skull Valley do not exclusively use any particular portion of the valley, the presence of the new rail line would not significantly contribute to habitat fragmentation, segregation, or interruption of habitat connectivity. Also, because there are no clearly defined migration or seasonal use patterns for the wildlife in Skull Valley, the new rail line would not significantly affect the movement of wildlife in the valley.

The truck transportation option for Skull Valley would include an ITF near Timpie. There are no unique habitats that would be cleared for the ITF near Timpie; therefore, impacts to wildlife are expected to be small. Because no road widenings are proposed for the Skull Valley Road alternative, impacts to listed species dependent on springs and wetlands to the north of the facility are not expected. These species would include mink, ringtail, speckled dace, Great Basin spadefoot, bobolink, common yellowthroat, snowy plover, Caspian tern, American white pelican, herons, white-faced ibis, and long-billed curlew.

5.4.1.3 Wetlands

There are no wetlands that would be affected by construction of the Skunk Ridge transportation corridor or the ITF near Timpie (see Section 3.4.2.2.) There are no wetlands near the rail corridor or the ITF near Timpie. The largest wetland area in Skull Valley, Horseshoe Springs, is approximately 11 km (7 miles) from the rail corridor, nearly 16 km (10 miles) from the ITF near Timpie location, and approximately 335 m (1,100 ft) from Skull Valley road (see Figure 3.8). Several smaller springs are located near Skull Valley Road. The impact of construction on wetlands for transportation facilities would be small since there are none near any of the proposed construction areas.

5.4.1.4 Perennial and Ephemeral Streams

The construction of the rail line or the ITF near Timpie would have a small impact on streams. The proposed Skunk Ridge rail corridor would cross 32 ephemeral or intermittent drainages (see Section 2.1.1.3). Depending upon the time of year that rail construction occurs, disturbed soils entrained by these ephemeral desert washes could create minor short-term increases in the turbidity of any water in such streams. These impacts on streams would be small. A CWA Section 404 permit from the Corps of Engineers would be needed prior to construction of those sections of the Skunk Ridge rail corridor that would use culverts to cross these areas. Necessary permits are further discussed in Section 1.6 of this DEIS. Runoff from the ITF near Timpie would not enter any streams and, thus, would have a small impact on them.

The proposed new Skunk Ridge rail line would cross many ephemeral streams. These seasonally wet areas are important to many wildlife species and also provide water to roaming mammals, such as pronghorn antelope and mule deer. It is important to protect any streams or wetlands that may occur along the corridor. The new rail line would be designed such that natural drainages would be preserved; hence, any impacts to wildlife associated with a reduction in seasonal wet areas would be expected to be small.

5.4.1.5 Threatened and Endangered Species and Other Species of Special Concern

There are no plant species of special concern that occur in the area of the Skunk Ridge rail line or the ITF near Timpie. Thus, construction of these facilities would have no affect on special concern plant species.

State-listed endangered peregrine falcons have nested a few miles to the east of the proposed ITF site at the Timpie Springs Waterfowl Management Area. Peregrine falcons nesting in this area could use the ITF site for foraging. The construction of the ITF would have a small impact to peregrine falcons because only a small amount of land would be altered at the ITF and it is unlikely that the falcons foraging base (small mammals and birds) would be significantly impacted.

As documented in Section 3.4.3.2, raptors (i.e., hawks, falcons, owls, and eagles) are a group of birds which feed and nest throughout the area of the proposed rail corridor (Stone & Webster 1998; UDWR 1997a; PFS/ER 2000). Many of these birds are State or Federally listed (e.g., ferruginous hawk). Another listed predatory bird, the loggerhead shrike, is also found in Skull Valley. Construction of the rail line could disturb or destroy nesting habitat important to these species. However, with appropriate mitigation measures, impacts to these species are predicted to be small.

Even though hawks nest in trees along Skull Valley Road (Stone & Webster 1998; UDWR 1997a; PFS/ER 2000), the heavy-haul truck alternative is expected to only have small impacts to these birds because no road widening improvements that could impact nest trees are planned for Skull Valley Road.

Habitat for mammals, including the kit fox (a BLM-listed sensitive species) would be affected due to construction of the Skunk Ridge rail line. The kit fox may be displaced or forced to change movement patterns. Since the amount of affected habitat is a very low percentage of the available habitat in Skull Valley, impacts to the kit fox are predicted to be small.

Skull Valley pocket gophers may also be displaced or destroyed as a result of the construction of the Skunk Ridge rail line. With the implementation of surveys prior to construction, anticipated impacts to these gophers would be small.

5.4.2 Impacts During Operations

5.4.2.1 Vegetation

There would be no direct impacts on vegetation during operation of the Skunk Ridge rail corridor or ITF. Other potential impacts for the rail line corridor include additional wildfires from equipment sparking (PFS/RAI2 1999) as has been reported to occur elsewhere in the west (AmeriScan 1999).

Since revegetation of the rail corridor after construction would be required to follow BLM's fire management plan for Skull Valley (see Section 3.4.1.1), it would be possible for the rail corridor to function as a green strip to help prevent the spread of both wildfires and those caused by operation of the rail line. Planting a mixture of primarily native species along the corridor as listed in Table 5.2 would have a beneficial impact on the local ecosystem and biodiversity. Thus, the planting of species that both retard fires and also rehabilitate areas where invasive annuals are growing could benefit vegetation by increasing biodiversity and improving local ecosystems.

During operation of the rail line PFS would need to control noxious weeds and other non-native species within the rail corridor. PFS would use herbicides to control noxious weeds. EPA's labeling requirements control when and under what conditions herbicides can be applied, mixed, stored, or used (e.g., wind speed, relative humidity, air temperature, chemical persistence, time since last rainfall). By following these requirements, PFS would ensure that the impacts on non-target vegetation from the use of herbicides during the operational lifetime of the rail line would be small.

5.4.2.2 Wildlife

The Skunk Ridge rail option would bisect areas between the western edge of Skull Valley and the Cedar Mountains. There are no wintering or fawning areas for pronghorn antelope or mule deer along this route; however, both species use these areas. Truck or rail traffic could cause roaming wildlife to sometimes adjust their movements and migration patterns. However, these impacts are expected to be small.

Wildfires are frequent occurrences in Skull Valley. If the rail option is implemented for the PFS project, there may be an increase in the frequency of these fires (see Section 5.8.4). Certain wildlife species that are not very mobile (i.e., small mammals and certain nesting birds) could be killed as a result of the increased frequency of fires. More mobile species would be able to avoid the fires. Cheatgrass has become a dominant plant species in Skull Valley. This habitat is considered a threat to the desert populations of the golden eagle in north-central Utah, because cheatgrass invasion in combination with wildfires results in the reduction of jackrabbit populations (Bednarz 1999; USDI 1996; Keller et al. 1998). Jackrabbits are an important food source for golden eagles. If the frequency of wildfires does not increase significantly above current levels, impacts to small mammals and those species dependent on small mammal prey species would be expected to be small because their species and their habitat would not be significantly affected by operation of the rail line. As set forth in Section 5.4.2.1, revegetated areas of the rail line corridor may function as a green strip to help prevent the spread of wildfires. Accordingly, impacts to small mammal prey species and, consequently, golden eagles are expected to be small.

5.4.2.3 Wetlands

There are no wetlands that would be impacted by operation of the Skunk Ridge transportation corridor. The major wetland area in Skull Valley, Horseshoe Springs, is approximately 11 km (7 miles) from the Skunk Ridge transportation corridor. There are no wetlands along the rail corridor itself. Thus, the impact on wetlands of corridor operation would be small.

5.4.2.4 Perennial and Ephemeral Streams

The operation of the rail line or an ITF near Timpie would have a small impact on streams. The proposed Skunk Ridge rail corridor would cross a number of ephemeral or intermittent drainages, but operation of the rail line would have only a small impact on them because the rail line would be designed such that natural drainages would be preserved. There are no perennial or ephemeral streams near the site for the ITF.

5.4.2.5 Threatened and Endangered Species and Other Species of Special Concern

There are no plant species of special concern that occur in the area of the Skunk Ridge rail line or the ITF near Timpie. Thus, the impact on special concern plant species of operating those facilities would be small. Listed wildlife species, from time to time, would need to adjust their movement patterns due to either the rail line or heavy-haul transport. This impact is considered to be small.

5.4.3 Impacts at the Alternative Site B

Direct and indirect impacts of construction and operation of either transportation option to Site B would be essentially the same as those for the proposed site (Site A) as discussed in Sections 5.4.1 and 5.4.2.

5.4.3.1 Vegetation

The Skunk Ridge rail corridor to the alternative site (i.e., to Site B) on the Reservation would require 10 ha (24 acres) more land to be cleared than the route to Site A for a total of 324 ha (800 acres). While the impacts along this transportation corridor would be similar to those described in Section 5.4.1 for the route to Site A, the spatial extent of such impacts would be somewhat greater but still small.

5.4.3.2 Wildlife

The potential impacts to wildlife species as a result of construction and operation of rail line or the heavy haul truck route would be similar to those of the proposed action. With the appropriate mitigation employed, all potential impacts are predicted to be small.

5.4.3.3 Wetlands

The impacts on wetlands of the Skunk Ridge rail corridor to the alternative site (i.e., to Site B) on the Reservation would be similar to those for Site A (i.e., they would be small).

5.4.3.4 Perennial and Ephemeral Streams

The impacts on perennial and intermittent streams of the Skunk Ridge rail corridor to the alternative site (i.e., to Site B) on the Reservation would be similar to those for Site A (i.e., they would be small).

5.4.3.5 Threatened and Endangered Species and Other Species of Special Concern

The impacts on plant and wildlife species of special concern of the Skunk Ridge rail corridor to the alternative site (i.e., to Site B) on the Reservation would be similar to those for Site A (i.e., they would be small).

5.4.4 Mitigation Measures

5.4.4.1 Vegetation

BMPs described in Table 2.7 should be used for construction of the rail line or ITF near Timpie. A mixture of the plant species listed in Table 5.2 should be planted along the rail corridor to revegetate it following construction. In addition to the seed mix, the revegetation plan should follow guidelines currently used by BLM, such as the Interagency Forage and Conservation Planting Guide for Utah, EC 438, or other current guidelines. All of these species, except prostrate Kochia (*Kochia prostrata*), are native species, and all except Lewis flax (*Linum lewisii*) have a high fire tolerance (USDA NRCS 1999). Planting a mixture of primarily native species along the corridor as listed in Table 5.2 would have a beneficial impact on the local ecosystem and biodiversity and should be investigated when the revegetation plan is being finalized. Qualified personnel who are familiar with the local area should be specifically consulted. In addition to individuals from the local BLM office, consultation with staff of the Forest Service's regional facilities and at area universities would help identify native species to use. The cooperating agencies recommend this mitigation be required (see Section 9.4.2). (See Section 4.4.5 for a discussion of the use of native species in revegetation.)

PFS would be responsible for the control or eradication of noxious weeds within the rail line right-of-way. Noxious weeds could be controlled by using herbicides, biological controls, or mechanical clearing. The use of herbicides should be restricted to as small an area as necessary. Herbicides must also be applied at the proper stage of plant growth to be effective (Whitson 1998). Herbicides must be used in compliance with all applicable laws, including EPA's labeling instructions for prescribed environmental conditions (e.g., wind speed, relative humidity, air temperature, chemical persistence, time since last rainfall). The cooperating agencies recommend that PFS be required to consult with BLM prior to construction in order to develop an adequate plan for controlling noxious weeds during the operational lifetime of the proposed rail line (see Section 9.4.2). This consultation should be coordinated with the consultation with BIA regarding the use of herbicides during operation of the proposed PFSF. The plan should include an approved list of herbicides and consideration of non-chemical (e.g., biological) means of controlling noxious weeds (BLM 1991). It should incorporate BLM's most recent standard stipulations for chemical treatment (i.e., spraying) of vegetation (e.g., see Appendix 5 in BLM 1983).

5.4.4.2 Wildlife

Prior to construction, a survey for Skull Valley pocket gopher burrows should be conducted. If burrows are located within 30 m (100 ft) of any proposed construction along the rail corridor or at the ITF site, BLM should be notified. BLM would determine the significance of the location (e.g., is it within the middle of a gopher town, or an isolated burrow on the edge of the gopher town). Specific mitigation measures would be based upon that determination, and could range from relocation of the rail line if it is within the middle of a gopher town to allowing construction to continue if the rail line only intersects the outside boundaries of a gopher town. The cooperating agencies recommend PFS be required to survey, prior to construction, the proposed rail line corridor for pocket gophers (see Section 9.4.2).

To help minimize impacts to the movements of pronghorn antelope and mule deer, as well as other wildlife species, provisions should be made in the railroad design to allow for a number of wildlife crossings, over or under the rail line. The final design for such crossings will be developed in consultation with BLM as part of the right-of-way approval process.

Activities associated with rail line construction could affect nesting success or raising young birds. Before construction begins, PFS should complete a survey for raptor nests (including hawks, owls, eagles, and the loggerhead shrike) within 0.8 km (0.5 mile) of the vicinity of the new rail transportation corridor. If the survey indicates active nests are present, construction activities should be curtailed or restricted during the period from April 1 to August 15 (Stone & Webster 1998; UDWR 1997) to avoid affecting nesting success or raising young. If the raptor surveys reveal that there is great horned owl or golden eagle nesting within 0.8 km (0.5 mile) of the proposed rail line corridor, construction activities should be similarly curtailed or restricted during the period from February through August (UDWR 1997). The cooperating agencies recommend PFS be required to survey, prior to construction, the proposed rail line corridor for raptors (see Section 9.4.2).

5.5 Socioeconomic and Community Resources

The potential socioeconomic impacts and impacts to community resources of two local transportation options have been assessed: (a) constructing and using a proposed new rail line from Skunk Ridge to the proposed PFSF and (b) constructing a new ITF near Timpie and using heavy-haul vehicles on the existing Skull Valley Road. Both the direct and indirect impacts to socioeconomic and community resources during construction and use of these local transportation options to the proposed PFSF are primarily associated with workers who might move into the area and use of heavy-haul vehicles on Skull Valley Road or the use of the rail corridor also result in impacts. Impacts to the socioeconomic and community resources of the Skull Valley Band and their Reservation are indistinguishable from those to the remainder of Tooele County with the exceptions of population, land use, and economic structure. Impacts specific to the Skull Valley Band, as compared to the remainder of Tooele County, are noted in the following discussion, as appropriate.

These impacts are summarized in Table 5.3, and as discussed in the following paragraphs, would be small.

Table 5.3. Potential impacts to socioeconomic and community resources during the construction and use of new transportation facilities in Skull Valley

Category of potential impact	Significance level of potential impact	
	New rail siding and corridor	New ITF near Timpie
Population	Small	Small
Housing	Small	Small
Educational system	Small	Small
Utilities	Small	Small
Solid waste	Small	Small
Transportation and traffic	Small	Small
Land use	Moderate	Small
Economic structure	Small (but beneficial)	Small (but beneficial)

The overall approach to the assessment of impacts to socioeconomic and community resources is described in Section 4.4. It involves the development of an estimate of the number of construction workers that might move into the area. Both direct construction jobs and indirect jobs are considered. These numbers are used to determine the potential increase in the existing population, the demand on local housing, and the number of new children that might be enrolled into the existing school system. These increased numbers of people in the local area serve as the basis for determining impacts to socioeconomic and community resources during all phases of construction. The analytical approach and method (of determining the potential number of in-moving workers) are described for the new rail line and the alternative ITF in Sections 5.5.1 and 5.5.2, respectively.

5.5.1 Construction Impacts

5.5.1.1 New Rail Line from Skunk Ridge

During the 14-month construction period for the rail line and its associated siding, an estimated peak work force of 125 workers would be required for various tasks. The bulk of the manpower would be for earthwork. This portion of the work is estimated to take approximately 109 workers including equipment operators, laborers, electricians, iron workers, concrete finishers, and construction supervision staff. The remainder of the work involves preparing the route for the rail line and laying the track; approximately 16 workers would be required to support the track-laying machine. The number of workers required to operate the proposed rail line is incorporated into the work force for operation of the proposed facility itself (see Section 4.5.2).

Following the same approach and using the same assumptions in the assessment of socioeconomic impacts of constructing the proposed PFSF (see Section 4.5.1), if 30 percent of the direct workforce (approximately 38 workers) moves into the area, and approximately 60 percent of those (23 workers) were accompanied by families (with a family size of 2.87), the local population would increase by 81 residents in 38 households due to direct employment. This translates into 15 workers unaccompanied by family, 23 workers accompanied by family, and 43 family members of construction workers. The construction of the rail line would also result in approximately 62 indirect jobs, with six of those workers moving into the area during the construction period. Assuming that 60 percent of these workers bring families and that the average family size would be 2.87, an upper bound of 14 new residents in six households would be expected as the result of indirect employment. Combining the above direct and indirect in-moving persons yields a total of 95 new residents in 44 households as an upper bound. Unaccompanied workers would live in 17 of these households while the other 27 households would consist of workers and their families. Based on the Tooele County average of 0.7 school aged children per household (Governor's Office of Planning and Budget, Economic and Demographic Projections, 1997; http://www.governor.state.ut.us/dea/demographics/household.htm), it is expected that 19 additional children would be added to local schools.

Population. Impacts of construction of the rail line to the population levels of Tooele County are expected to be small. Workers who move to the impact area during construction of the new rail line would probably be distributed in communities in the eastern portion of Tooele County (e.g., Grantsville and Tooele) because they are closest to the proposed rail line and to housing and have vacant housing units available for rent and sale. It is unlikely that any in-moving workers and their families would locate in Skull Valley itself since there are few, if any, housing units available; it is possible that members of the Skull Valley Band who return to their Reservation for employment during construction of the proposed rail line might decide to live on the Reservation. The precise distribution of inmovers would be determined by a number of factors, including proximity to the proposed rail line and the availability of housing and public services. The 95 new residents used as an upper bound in this analysis would represent an increase of 0.3 percent to the 1996 population of Tooele County. If all of these inmigrants located in either Grantsville or Tooele, the population increase would be 1.9 percent in Grantsville or 0.6 percent in Tooele. While growth of this magnitude could be readily accommodated without disrupting the affected communities, it is very unlikely that all new residents would settle in a single community.

Housing. Any housing impacts from construction of the rail line are expected to be small. Construction workers would need to seek housing in nearby towns because BLM will not permit camping or temporary trailers on public lands. The 44 new households used as an upper bound in this analysis would represent 12.6 percent of the vacant housing units, not counting housing units in Wendover or Dugway, that were for sale or rent in Tooele County in 1990 (the most recent year for which data are available). Even if all project-induced inmovers settled in either Grantsville or Tooele, which is highly unlikely, it would not exceed the number of vacant units for sale or rent in either of these communities. Accordingly, any housing impacts are expected to be minimal.

Education. The impacts to the existing education system during construction of the rail corridor are expected to be small. The addition of 19 new school-age children would increase enrollment in Tooele County by only 0.23 percent. Even in the highly unlikely event that all inmovers would locate in a single community, the increases in enrollment would be relatively small. For instance, if all new students were enrolled in elementary school in the city of Tooele, there would be an increase of approximately 1 percent, 2.6 percent if all new students were enrolled in the Tooele Junior High School, or an increase of 1.3 percent if all new students were enrolled in the Tooele High School; similarly, if all the new students were enrolled at schools in Grantsville, the increases would be 2.5 percent in the elementary school, 3.6 percent in the middle school, or 2.4 percent in the high school. It should be noted, however, that the Tooele County School District has already embarked on a significant expansion of its capacity, so that any additional increase would not place demands on the system that have not already been anticipated.

Utilities. The impacts of constructing the rail line on the provision of water and other utilities within Skull Valley, including impacts to the Skull Valley Band, are expected to be small. The addition of 44 new households and 95 new residents is not expected to strain existing utilities within the impact area, since most if not all of those inmovers would be expected to occupy currently vacant housing units already hooked up to utilities (e.g., in Rush Valley or Tooele Valley).

Solid and sanitary waste. Impacts to solid waste management are expected to be small to non-existent. Clearing of the right-of-way would involve the removal and disposal of vegetation along the 12-m (40-ft) wide rail bed, at cut and fill areas, and at soil stockpile locations within the temporary use areas. Woody vegetation would be shredded and scattered in place. Sanitary wastes would be managed with conventional systems, such as portable toilets.

Transportation and traffic. Impacts to transportation by construction of the rail line are expected to be small. Construction of the rail line and siding would require the movement of large quantities of excavated soils and ballast and sub-ballast as well as workers to construction areas. It is anticipated that most materials and workers would travel to the site of the proposed rail siding by way of Interstate 80. PFS has indicated that materials and workers would travel to each point of construction by way of the rail line as construction proceeds along the proposed route. Nothing would prevent PFS from transporting materials and workers on unimproved roads (i.e., dirt) that are adjacent to the rail corridor. If PFS uses these dirt roads frequently or to transport heavy materials, the roads would degrade and become impassable because of the type of soils in the area (see Section 3.1). If PFS determines that it is necessary to use the dirt roads, action should be taken to minimize the impact.

As noted in Section 2.1.1.3, an attempt would be made to balance the expected volume of cuts and fills to minimize the need for additional fill material. With such an effort, a surplus of approximately

196,000 m^3 (256,000 yd^3) of material could be generated. In addition to the movement of excavated soils, which would have minimal impact on transportation due to the intent to keep such materials near the point of generation, construction of the proposed rail line and siding would require approximately 245,000 m^3 (320,000 yd^3) of ballast and sub-ballast (composed of crushed gravel or rock) to be obtained from one or more existing commercial gravel pits in the area. Assuming a per-truck capacity of approximately 15.3 m^3 (20 yd^3) (PFS/ER 2000) for movement of the ballast and sub-ballast, a total of approximately 32,000 truck trips would be required to transport the ballast and sub-ballast (a truck trip, or vehicle trip, is defined as a single one-directional vehicle movement; hence, a vehicle arriving and departing the point of delivery constitutes two vehicle trips). Assuming that these 32,000 trips are made evenly throughout 12 months of the 14-month construction period, there would be approximately 134 truck trips per day (67 trucks going each way on Interstate 80 to and from the point of ballast and sub-ballast delivery) or approximately 13 vehicles per hour.

In addition to ballast and sub-ballast deliveries, a peak construction work force of 125 workers would commute to and from the construction site in individual passenger vehicles and light trucks on a daily basis. These workers could account for an increase of 250 vehicle trips per day on Interstate 80 during construction of the rail line and siding. All together, construction of the rail line and siding could result in an increase of 384 vehicle trips per day on Interstate 80 (250 vehicle trips per day for the construction workers and 134 vehicle trips per day for the ballast and sub-ballast delivery). This increase amounts to approximately 4.5 percent greater use of Interstate 80 than had been experienced in 1995 (see Section 3.5.2.4). This additional traffic volume would have a negligible effect on the level of service on Interstate 80 but could have adverse effects on the movement of traffic onto and off of the interstate. This adverse effect on feeders to and from Interstate 80 also results from delivery trucks moving at a slower rate of speed before entering and after leaving Interstate 80 than other traffic, requiring other traffic to reduce travel speed.

Land use. Impacts to current land use from construction of the rail line are expected to be moderate. The proposed right-of-way between Skunk Ridge and the proposed facility crosses public land administered by BLM's Salt Lake Field Office. Construction of the rail line could result in some reduced use of this resource by members of the public (Section 5.8.3). In addition, some grazing activities on the Eightmile and Black Knoll Pastures of the Skull Valley grazing allotment might be temporarily curtailed during construction of the rail line from Skunk Ridge but should return to pre-construction levels following construction.

The proposed rail route through Skull Valley would disrupt livestock movement between bench areas and cheatgrass flats. Since water is predominantly located west and above the proposed route in most areas, grazing would be intensified along the bench areas, resulting in greater utilization and potential rangeland degradation. Wild horse use in this area is also quite significant, and the proposed rail line could have a similar effect on their use of these bench areas.

The proposed route would cross two Pasture and Allotment division fences. The fences run east-west across the valley. The route would also cross several unimproved roads which are equipped with cattle guard crossings to prevent livestock movement between pastures. PFS plans to include cattle guards along the rail route wherever the route crosses Pasture and Allotment division fences. Three livestock water pipelines also cross the rail route line; provision would be made to keep them serviceable.

Economic structure. Because the construction workforce (direct and indirect) would be only 125 people and the construction period would be 14 months, the effect of the proposed action on the economic structure of the local area would be small, but favorable. The unemployment rate in Tooele County has the potential to fall slightly in the impact area due to the hiring of current residents and the in-moving of project employees. In addition, impacts to the economic structure of the Skull Valley Band should be proportionately greater, since any construction jobs that might be filled by tribal members would constitute a positive impact on the tribal economy.

5.5.1.2 New ITF Near Timpie

Construction of the ITF and its associated rail siding and access road would require an estimated peak work force of 35 workers and would be performed within one year of issuance of an NRC license for the proposed PFSF. The bulk of the manpower would be for earthwork, pouring the building foundation, erecting the gantry crane and metal building, installing building electrical and mechanical infrastructure, laying railroad track, paving the access road, and installing site fencing. The work force would include equipment operators, laborers, electricians, iron workers, concrete finishers, and construction supervision staff.

Following the same approach and using the same assumptions in the assessment of socioeconomic impacts of constructing the proposed PFSF (see Section 4.5.1), if 30 percent of the direct workforce (approximately 11 workers) moves into the area, and approximately 60 percent of those (seven workers) were accompanied by families (with a family size of 2.87), the local population would increase by 24 residents in 11 households due to direct employment; this translates into four workers unaccompanied by family, seven workers accompanied by family, and 13 family members of construction workers. The construction of the rail line would also result in approximately 18 indirect jobs, with two of those workers moving into the area during the construction period; assuming that one of these workers brings a family and that the average family size would be 2.87, an upper bound of four new residents in two households would be expected as the result of indirect employment. Combining the above direct and indirect in-moving yields a total of 28 new residents in 13 households as an upper bound. Unaccompanied workers would live in five of these households while the other eight households would consist of workers and their families. Based on the Tooele County average of 0.7 school aged children per household (Governor’s Office of Planning and Budget, Economic and Demographic Projections, 1997; http://www.governor.state.ut.us/dea/demographics/household.htm), it is expected that six additional children would be added to local schools.

Population. Impacts of construction of the ITF to populations levels in Tooele County are expected to be small. Workers who move to the impact area during construction of the ITF and associated siding would probably be distributed in communities in the eastern portion of Tooele County (e.g., Grantsville and Tooele) because they are closest to the proposed site for the ITF and have vacant housing units available for rent and sale. It is unlikely that any in-moving workers and their families would locate in Skull Valley itself since there are few, if any, housing units available; it is possible that members of the Skull Valley Band who return to their Reservation for employment during construction of the ITF might decide to live on the Reservation. The precise distribution of inmovers would be determined by a number of factors, including proximity to the proposed ITF and the availability of housing and public services. The 28 new residents used in this analysis as an upper bound would represent an increase of less than 0.1 percent to the 1996 population of Tooele County. If all of these inmigrants located in either Grantsville or Tooele, the population increase would be 0.6 percent in Grantsville or 0.2 percent in Tooele. While growth of this magnitude could be accommodated without disrupting the affected communities, it is very unlikely that all new residents would settle in a single community.

Housing. Any housing impacts from construction of the ITF are expected to be small. The 13 new households used as an upper bound in this analysis would represent approximately 3.8 percent of the vacant housing units, not counting housing units in Wendover or Dugway, that were for sale or rent in Tooele County in 1990 (the most recent year for which data are available). Even if all project-induced inmovers settled in either Grantsville or Tooele, which is highly unlikely, it would not exceed the number of vacant units for sale or rent in either of these communities.

Education. The addition of six new school-age children would increase enrollment in Tooele County by only 0.07 percent. Even in the highly unlikely event that all inmovers would locate in a single community, the increases in enrollment would be very small.

Utilities. The impacts of constructing the ITF on water use and other utilities within Skull Valley are expected to be small. The addition of 13 new households and 28 new residents is not expected to strain existing utilities within the impact area, since most if not all of those inmovers would be expected to occupy currently vacant housing units already hooked up to utilities (e.g., in Rush Valley or Tooele Valley).

Solid and sanitary waste. Impacts to solid waste management are expected to be small to non-existent. Clearing of the right-of-way for the ITF parcel would involve the removal and disposal of vegetation within the right-of-way. Any woody vegetation would be shredded and scattered in place. Sanitary wastes would be managed with conventional systems, such as portable toilets.

Transportation and traffic. Impacts of the construction of the ITF on the local transportation system are expected to be small. Construction of the ITF and associated access road and rail siding would require the movement of excavated soils and ballast and sub-ballast. The amount of ballast, sub-ballast, and other rail bed construction materials needed for the rail siding amounts to approximately 14,420 m^3 (18,850 yd^3), and approximately 1,900 m^3 (2,500 yd^3) of asphalt paving would also be needed (PFS/RAI2 1999). The ballast and sub-ballast (composed of crushed gravel or rock) would be obtained from one or more existing commercial gravel pits in the area. Assuming a per-truck capacity of approximately 15.3 m^3 (20 yd^3) (PFS/ER 2000) for movement of the ballast and sub-ballast, a total of approximately 1,885 truck trips would be required to transport the ballast and sub-ballast (a truck trip, or vehicle trip, is defined as a single one-directional vehicle movement; hence, a vehicle arriving and departing the point of delivery constitutes two vehicle trips). Assuming that these 1,885 trips are made within a three month period of the 12-month construction period, there would be approximately 31 truck trips per day (15 to 16 trucks going each way on I-80 to and from the point of ballast and sub-ballast delivery) or approximately three vehicles per hour.

In addition to ballast and sub-ballast deliveries, a peak construction work force of 35 workers would commute to and from the construction site in individual passenger vehicles and light trucks on a daily basis. These workers will account for an increase of 70 vehicle trips per day on Interstate 80 during construction of the ITF and associated access road and rail siding. All together, construction of the ITF and associated access road and rail siding would result in an increase of approximately 100 vehicle trips per day on Interstate 80. This increase amounts to approximately 1.2 percent greater use of the interstate than had been experienced in 1995 (see Section 3.5.2.4). This additional traffic volume would have a negligible effect on the level of service on Interstate 80 but could have some adverse effects on the movement of traffic onto and off of the interstate. This adverse effect on feeders to and from Interstate 80 also results from delivery trucks moving at a slower rate of speed before entering and after leaving the interstate than other traffic, requiring other traffic to reduce travel speed.

Land use. Construction of the ITF would have small impacts on current land use. The site for the ITF and associated access road and rail siding is located on previously disturbed, but currently unused public land, administered by the BLM. The site is adjacent to the Union Pacific main line.

Economic structure. Because the construction workforce (direct and indirect) would be 35 people and the construction period would be less than one year, the effect of the proposed PFSF on the economic structure of the local area would be small but favorable. The unemployment rate in Tooele County would have the potential to fall slightly in the impact area due to the hiring of current residents and the in-moving of project employees. In addition, impacts to the economic structure of the Skull Valley Band should be proportionately greater, since any construction jobs that might be filled by tribal members would constitute a positive impact on the tribal economy.

5.5.2 Impacts During Operations

Direct impacts to socioeconomic and community resources are primarily associated with any physical changes to those resources that would result from operation of either of the two local transportation options. Indirect impacts are primarily associated with workers and families who might move into the area and place additional demands on existing resources. As discussed in the following paragraphs, both direct and indirect impacts are expected to be small.

5.5.2.1 New Rail Line from Skunk Ridge

Direct impacts of the proposed rail line for the movement of SNF from Skunk Ridge to the proposed PFSF would have small to moderate impacts to socioeconomic and community resources. This is because the change to the physical environment required for operation of the rail line impinges directly on livestock grazing resources (direct impacts to recreational resources and opportunities are addressed in Section 5.8.3). The increased risk of fire associated with use of the proposed rail line could also have a corresponding effect on the availability of livestock and wildlife forage in the event of a spark-induced fire (see Section 5.8.4). However, revegetated areas of the rail line may function as a green strip to help prevent the spread of fire (see Section 5.4.2.1). Such a fire barrier would minimize the potential impact from any spark-induced fires.

The socioeconomic and community resource impacts from operation of the rail line from Skunk Ridge to the proposed facility are a function of the anticipated traffic on this new line compared to the existing traffic on the main Union Pacific line. PFS plans no more than one or two round trips per week using the new rail line, and this volume of traffic is sufficiently small as not to result in any significant impacts (including impacts to grazing or recreational activities).

Indirect impacts are expected to be small, since the work force required to operate the proposed rail line, which is incorporated in the work force for operation of the proposed facility itself (see Section 4.5.2), is very small. Since the indirect impacts to socioeconomic and community resources associated with the PSFS workforce itself were small, they would likewise be small for operation of the proposed rail line.

5.5.2.2 New ITF Near Timpie

Direct impacts of using the ITF/heavy haul local transportation option are also expected to be small, although the use of Skull Valley Road to transport fabricated steel liners for the storage casks and 2 to 4 round trip shipments, per week, of SNF in shipping casks to the proposed project site, could result in possible delays for traffic along Skull Valley Road (see Section 4.5.2).

The socioeconomic and community resource impacts of using an ITF and transporting the SNF in canisters in heavy-haul tractor/trailers on Skull Valley Road to the proposed facility are a function of the amount of heavy-haul traffic on Skull Valley Road. PFS plans two to four round trips per week for the heavy haul transportation of casks along the 42-km (26-mile) segment of Skull Valley Road from the proposed ITF to the proposed PFSF (PFS/ER 2000). The heavy haul tractor/trailers would move at a slow rate of speed [32 km/h (20 mph)], requiring other traffic to reduce travel speed or make additional passing maneuvers (PFS/ER 2000). Utilization of heavy haul equipment for cask transportation would result in the transportation vehicle passing within approximately 15 m (50 ft) of two residences located along Skull Valley Road (PFS/ER 2000). In addition, there is some potential for inconveniencing regular traffic along Skull Valley Road as a result of these movements, but the small number of round trips per week should result in no significant impacts.

Indirect impacts are also expected to be small, since the workforce required to operate the ITF, with the exception of the heavy haul truck drivers, are part of the work force for operation of the proposed facility itself (see Section 4.5.2). Since the indirect impacts to socioeconomic and community resources associated with the PFSF workforce itself have been determined to be small (see Section 4.5.2), they would likewise be small for operation of the ITF and heavy haul transportation option.

5.5.3 Impacts at the Alternative Site B

The alternative location (i.e., Site B) in Skull Valley for the proposed facility lies just south of the preferred site. Because Site B is very close to the preferred site, there would be no discernible differences in the anticipated impacts to socioeconomic and community resources during construction or operation for either of the local transportation options.

5.5.4 Mitigation Measures

Since the direct and indirect impacts of construction and operations for both local transportation options to socioeconomic and community resources are considered small to moderate, few mitigation measures are required.

The only socioeconomic and community resources that are potentially adversely affected by construction and operation of the proposed transportation facilities are (1) livestock, in that there could be disruptions to livestock management, including livestock movement across the tracks both within and between pastures for the new rail line option and (2) transportation, in that there could be increased traffic along Interstate 80 and Skull Valley Road for the ITF/heavy-haul option. Mitigations for these impacts are discussed in the following paragraphs.

The potential for impacts to livestock management arises due to conflicts between existing use of the land and its water resources and the construction and use of the proposed rail line. Consideration should be given to the avoidance or amelioration of adverse impacts to grazing by taking several actions, including the repair and maintenance of Pasture and Allotment division fences crossed by the proposed rail line in such a manner that livestock would not be able to cross from one area to the other (e.g., cattle guards); cooperating with the BLM and permitees to develop watering facilities east of the proposed rail route for the purposes of providing watering facilities for livestock and for use for fire suppression; providing livestock-secure fenceline crossings; installing gates at crossings of unimproved roads; and developing fire mitigation and detection plans in cooperation with BLM. The cooperating agencies recommend that PFS be required to develop a plan to minimize impacts to livestock grazing activities during construction and operation (see Section 9.4.2).

The potential for traffic impacts arises due to the anticipated increase in the use of Skull Valley Road by construction and operation workers, as well as the possible use of heavy-haul vehicles under the ITF transportation option. The potential for adverse impacts to traffic during operations on Skull Valley Road would be greatest during the movement of fabricated steel liners and SNF to the proposed facility. The magnitude of such impacts are discussed above. Consideration should be given to the avoidance or amelioration of adverse transportation impacts by appropriate scheduling of facility-related traffic.

Degradation of the unimproved roads, adjacent to the proposed rail line corridor, could occur if they are used frequently by PFS or used to transport heavy materials. If PFS determines that it needs to use the unimproved roads, PFS should minimize the impacts to these roads by covering them with gravel, or occasionally blading the roads and using a coating such as magnesium-chloride. The cooperating agencies recommend that PFS be required to develop a plan to minimize impacts to the unimproved roads (see Section 9.4.2). The plan should include one or more of the methods described above.

5.6 Cultural Resources

5.6.1 Construction Impacts

5.6.1.1 New Rail Line from Skunk Ridge

As discussed below, impacts are expected to be small to moderate. Under the proposed action, development of the proposed Skunk Ridge transportation route would involve construction of a new rail siding at Skunk Ridge and construction of a rail line southward through the western portion of Skull Valley to Site A on the Reservation. An intensive field cultural resources survey of the proposed rail alignment has documented the presence of two historic period properties within the corridor (Newsome 1999). One of these consists of a rock alignment and cairn (42TO1187) which is believed to be historic in age but which is without artifacts. Therefore, this site was not fully evaluated for NRHP eligibility. The centerline of the transportation corridor passes just west of the primary features at this site.

The other site is a fairly well preserved segment of the historic emigrant trail known as the “Hastings Cutoff” (of the California National Historic Trail) (42TO709). Because of its high degree of physical integrity and association with significant historical events and people, the Hastings Cutoff segment is considered to be eligible for listing on the NRHP. Because the proposed transportation corridor crosses the Hastings Cutoff segment at essentially a right angle, construction of the railroad would directly impact only a short segment of the trail. In addition to the physical integrity of the trail in this area, the Skull Valley setting is one without extensive development of modern intrusions. Therefore, the general environmental setting retains a visual impression of the original landscape during the westward migration of the mid-1800s. As a consequence, construction of the Skunk Ridge rail line will be an intrusion on both the cultural landscape aspect and physical vestiges of this historic episode.

In addition to the two historic properties discussed above, the field survey recorded four instances of isolated artifacts in the Skunk Ridge rail corridor, three of which are historic in origin. None of the isolated finds is considered eligible for listing on the NRHP.

Historic properties known to be present at the proposed Skunk Ridge rail siding include abandoned segments of the old U.S. Highway 40, a possible segment of the older Victory/Lincoln Highway, a historic telephone line, and the historic Union Pacific Railroad with associated features including a possible historic Western Union telegraph line. None of these resources has been evaluated, though some appear to suffer from poor integrity. In the southern part of the rail corridor, two abandoned 19th century trails may be present. These are the Road to Sulphur Spring and the Road to Deep Creek (GLO Map 1871). Neither of these resources has been evaluated, and additional work should be performed to identify and evaluate these resources.

Construction of the railroad along the western edge of Skull Valley would directly impact one cultural resource (i.e., Hasting Cutoff) that is considered eligible for listing on the NRHP, and may impact another that has not been fully evaluated. Construction of the rail siding at Skunk Ridge could potentially impact at least three cultural resources (i.e., historic telephone line, historic Union Pacific Railroad, and the historic U.S. 40) that have not yet been evaluated. Because of this, the potential for impacts along this corridor is expected to be moderate but could be mitigated prior to construction (see Section 5.6.5). In addition, the potential to find buried cultural resources exists. PFS should implement measures to identify and evaluate any cultural resources encountered during construction to determine their significance.

5.6.1.2 New ITF Near Timpie

As discussed below, impacts of the ITF are expected to be small. Use of the existing Skull Valley Road for heavy-haul transportation would involve construction of a new ITF near Timpie and use of the existing Skull Valley Road. Historic features present in the vicinity of the proposed ITF include a historic telephone line and the historic Union Pacific Railroad with associated features. None of these resources has yet been evaluated. An archeological survey of this location revealed no archeological resources within the location itself (Newsome 1999). Therefore, the potential for impacts to cultural resources at the ITF location is considered to be small.

As discussed in Section 3.6, there are several known prehistoric and historic properties in the vicinity, including the historic Timpie Railroad Siding, active and abandoned historic ranches, the former Iosepa town site, historic trails and the early Lincoln Highway route, and several recorded archaeological sites. The eastern side of the valley also includes known, but unrecorded, historic period tribal winter village sites, and many other important named places on the landscape. However, use of the Skull Valley Road with no improvements would not impact known cultural resources along that corridor. Therefore, the heavy-haul alternative from Timpie to the preferred site on the Reservation would have a small potential for impacts to cultural resources.

5.6.2 Impacts During Operations

Normal operational activities to transport SNF to the PFSF on the Reservation are not expected to have potential for impacts to cultural resources since no additional ground disturbance will occur. Therefore, the overall potential for impacts is expected to be small.

5.6.3 Impacts at the Alternative Site B

The potential for transportation related impacts to cultural resources should the proposed PFSF be constructed at Alternative Site B on the Reservation are essentially the same as for Site A, and are expected to be small to moderate. Impacts from the ITF are expected to be small.

5.6.4 Native American Cultural Resources

Based on responses to consultation letters sent by the BLM to potentially affected tribes (Appendix B) and comments received during public scoping meetings, there are no identified traditional cultural properties or other traditional cultural resources known to exist along the Skunk Ridge rail corridor or at the ITF location. The former Native Hawaiian townsite of Iosepa and the currently protected associated cemetery, lie adjacent to the Skull Valley Road, but would not be affected by construction or heavy haul traffic since the road itself would not be altered. Based on the known information regarding the presence of traditional cultural places along the transportation features, the potential impacts to such resources are considered to be small.

5.6.5 Mitigation Measures

As part of the consultation process required by Section 106 of the NHPA, a memorandum of agreement (MOA) would be prepared that identifies the mitigation measures to be implemented by PFS. PFS has prepared a draft treatment plan (Newsome and Schroedl 1999) to mitigate project-related impacts to the Hastings Cutoff trail segment. The plan proposes photographic and historical documentation of the affected trail segment extending across Skull Valley. This plan is being revised to include detailed description of the trail segment's characteristics and condition, and digital mapping. Mitigation of impacts to historic resources at the proposed Skunk Ridge rail siding would be required if these features were found to be eligible for listing on the NRHP. Documentation required as part of the evaluation process should constitute adequate mitigation of impacts to these features. These measures are being proposed in the revisions of the treatment plan. The treatment plan will be further revised as needed to reflect the decisions reached during the consultation process. The cooperating agencies recommend that PFS be required to develop a plan to ensure all mitigation measures specified by the MOA are completed (see Section 9.4.2).

Mitigation of impacts to historic resources at the ITF location near Timpie could be required if adjacent historic features (e.g., telegraph lines or other transportation routes) were found to be eligible for listing under the NHPA. Documentation required as part of the evaluation process should constitute adequate mitigation of impacts to these features. These measures are being proposed in the revisions of the treatment plan.

PFS should develop a plan to identify and evaluate any cultural resources encountered during construction of the rail line or ITF. The plan should include training of personnel to identify cultural resources and access to qualified individuals that can access the significance of the resource. The cooperating agencies recommend that PFS be required to implement these mitigation measures (see Section 9.4.2).

5.7 Human Health Impacts of SNF Transportation

This section discusses the radiological and non-radiological human health impacts associated with transportation of SNF from nuclear power plants to the proposed PFSF in Skull Valley. For cross-country transportation to the proposed PFSF, only shipments by rail are analyzed because PFS plans to receive only rail casks under its NRC license. However, also considered are rail shipments that might involve a short highway (or barge) segment to reach a rail line, for reactor sites that do not have direct rail access, or if an ITF is constructed in Skull Valley. This DEIS also documents an evaluation of impacts of transporting SNF from the PFSF to a permanent repository. A DEIS prepared by DOE (DOE 1999) addresses in detail the national and regional transportation impacts of building and operating a permanent repository at Yucca Mountain, Nevada. Because Congress has directed DOE to study only Yucca Mountain for the proposed repository, this analysis includes an evaluation of transporting by rail all SNF that would be stored at the proposed PFSF to the Utah-Nevada border on its way to the permanent repository.

The non-radiological human health impacts discussed in this section include (1) the occupational hazards from construction and operation of the proposed rail line and an ITF; (2) the safety impacts associated with increased rail traffic, which include an analysis of the increase in traffic accidents (e.g., derailments, crossing accidents) attributable to the additional rail traffic; and (3) human health effects due to vehicle exhaust emissions along the rail lines during transport of SNF to the proposed PFSF. The potential non-radiological impacts would also include socioeconomic impacts (see Section 5.5) and environmental justice impacts (see Section 6.2).

5.7.1 Non-Radiological Impacts

5.7.1.1 Potential Workers Injuries During Construction and Operation of Transportation Facilities

Potential health impacts to workers during construction and operation of transportation facilities in Skull Valley would be limited to the normal hazards associated with the construction and operational activities of these facilities (i.e., no unusual situations would be anticipated that would make the proposed construction activities more hazardous than normal for a major industrial construction project). The impacts of these hazards include fatal and nonfatal occupational injuries that may result from overexertion, falls, or being struck by equipment (NSC 1994). Because there are no unusual situations anticipated to make the construction-related activities more hazardous than normal, there would be only small impacts to worker health and safety due to fatal and nonfatal occupational construction-related activities. As discussed below, the staff finds the non-radiological health effects to be small.

During the construction and operation of either the proposed rail line or the ITF, non-radiological pollutants of concern to worker and public health would include the criteria pollutants and dust (both of which are addressed in Section 5.3). With adequate control measures, such as treating areas with water or chemical surfactants for dust suppression, etc., the impact on worker and public health would be expected to be small. There are no other potential non-radiological health impacts to the public from the proposed project, since members of the general public would not be allowed on the construction sites. Therefore, only fatal and nonfatal occupational injuries warrant any further analysis. These types of injuries are discussed below.

In order to estimate the number of potential fatal and nonfatal occupational injuries due to the construction, normal operations, and decommissioning of transportation facilities in Skull Valley, data on fatal occupational injuries per 100,000 workers per year and data on nonfatal occupational injuries per 100 full-time workers per year over the time period of 1994 to 1998 were collected from the Bureau of Labor Statistics (BLS) Internet Web site (http://stats.bls.gov/oshhcfoil.htm) and the Occupational Safety and Health Administration (OSHA) Internet Web site (http://www.osha.gov/oshstats/work.html). Visual inspection indicated no obvious time trend in the data for this period. The arithmetic mean and standard deviation for the fatal and nonfatal occupational injury rates were calculated. These BLS and OSHA data for the construction, trucking and railroad industries were used to estimate the potential fatal and nonfatal occupational injuries for the construction and normal operations of the proposed transportation facilities in Skull Valley. Table 5.4 presents the probability of fatal and nonfatal occupational injuries during the construction and normal operations of both the proposed rail line and the ITF.

Table 5.4. Estimated probabilities of fatal and nonfatal occupational injuries for the construction and normal operations for the proposed rail line and the ITF

Activity	Duration of activity	Probability of fatal injuries	Probability of nonfatal injuries
Construction			
Rail line	14 months	0.021	0.15
ITF	1 year	0.005	0.035
Operations			
Rail line	40 years[a]	0.0023	0.03
ITF	40 years[a]	0.034	0.18

[a]40 years includes 20 years of operations to load the storage area and 20 years of operations to empty the storage area.

Source: Bureau of Labor Statistics (BLS) Internet Web site (http://stats.bls.gov/oshhcfoil.htm) and the Occupational Safety and Health Administration (OSHA) Internet Web site (http://www.osha.gov/oshstats/work.html).

Potential worker injuries during construction. The transportation facilities facility would be subject to OSHA'S General Industry Standards (29 CFR Part 1910) and Construction Industry Standards (29 CFR Part 1926). Construction risks can be minimized by adherence to the procedures and policies required by OSHA and the state of Utah. These standards establish practices, procedures, exposure limits, and equipment specifications to preserve employee health and safety.

In addition OSHA inspections can also be employed in an effort to reduce the frequency of accidents and further ensure worker safety.

Potential fatalities. The construction of the proposed rail line would require a peak work force of 125 workers and would be completed in 14 months. Based on the aforementioned BLS statistics for construction worker fatal occupational injuries (i.e., fatalities), the probability of a fatality over the construction period is estimated to be 0.021. This estimate is conservative, because it assumes that a work force of 125 workers (the estimated peak workforce) would be employed for the entire construction period.

The construction of the ITF would require a peak workforce of 35 workers and would be completed in less than one year. The probability of a fatality during the construction of the ITF was estimated to be 0.005. This estimate is also conservative, because it assumes a force of 35 workers (the estimated peak workforce) would be employed for the entire construction period.

Potential nonfatal occupational injuries. Based on BLS statistics for construction worker nonfatal occupational injuries, the probability of a nonfatal injury over the 14-month construction period of the rail line is estimated to be 0.15. Based on BLS statistics for construction worker nonfatal occupational injuries, the probability of a nonfatal injury over the 1-year construction period for the ITF is estimated to be 0.035.

Potential worker injuries during operations. Following the construction of either of the two transportation facilities, SNF would be transported from the northern portions of Skull Valley to the proposed PFSF. Worker injuries may occur during these local transportation activities.

Potential fatalities. Operation of the proposed rail line would involve two employees operating a locomotive to move SNF to the proposed PFSF. These activities would occur over a 40-year period, including the receiving of SNF shipments and the shipment of SNF away from Skull Valley to a permanent repository. Based on BLS statistics of the railroad transportation industry, the probability of a fatality during the 40-year period is estimated to be 0.0023.

Operation of the ITF would require a four-man crew to move SNF on Skull Valley road. These activities would also occur over a 40-year period. Based on BLS statistics for the trucking and warehousing industry, the probability of a fatality during the 40-year period is estimated to be 0.034.

Potential nonfatal occupational injuries. An analysis of the railroad transportation industry's statistics indicates that the probability of a nonfatal injury on the proposed rail line during normal operations over 40 years would be 0.03.

For operation of the ITF and the heavy-haul vehicles down Skull Valley Road, the probability of a nonfatal injury expected during the 40-year operational period would be 0.18. This includes the risks of activities involving the transfer of SNF casks from railcar to truck at the ITF as well as transportation of SNF by heavy-haul vehicles on Skull Valley Road.

5.7.1.2 Rail Traffic Accidents

The proposed PFSF will have the capacity to store 4,000 casks. PFS has indicated that on average there would be 50 incoming shipments per year carrying four spent fuel casks each. On the basis of this information, the shipping campaign would last 20 years. The casks would subsequently be shipped from Skull Valley to a national repository for final disposal, and the PFSF could be emptied in 10 years by placing four casks on each train and making 100 shipments per year. Assuming 10 years of on-site storage with no incoming or outgoing SNF shipments, it can be inferred that the PFSF would then be operational for a total of 40 years.

The average distance by rail to the proposed PFSF from nuclear power reactors east of the proposed site in Skull Valley is 3,410 km (2,119 miles). If each SNF train travels an average of 3,410 km (2,119 miles) and brings four railcars (each with a single SNF shipping cask) into the proposed PFSF, the total distance covered by the trains for the entire campaign for shipping SNF to the facility will equal 13.6×10^6 railcar-km (8.5×10^6 railcar-miles). For trains eventually transferring casks away from the proposed PFSF to the permanent repository, the rail distance is estimated to be 950 km (590 miles). Thus, the total distance covered by trains in transferring all casks to the national repository would be 3.8×10^6 railcar-km (2.4×10^6 railcar-miles). Therefore, the total distance associated with the entire lifetime set of operations (i.e., both receiving SNF at and shipping SNF from the proposed PFSF) would be 17.4×10^6 railcar-km (10.8×10^6 railcar-miles). A round-trip calculation is included in this analysis to provide an upper bound on the number of railcar-km. The round-trip distances for the lifetime set of operations would then be 34.8×10^6 railcar-km (21.6×10^6 railcar-miles).

Vehicle-related accident risks involve accidents that result in injuries and fatalities that are not related to the cargo being shipped. Saricks and Kvitek (1994) examined these risks and found—based on national average accident statistics—that, considering all injuries and fatalities associated with regular trains, the rates were 4.26×10^{-8} injuries per railcar-km and 2.27×10^{-8} fatalities per railcar-km. Thus, the risk to the public from the shipping campaigns needed to get SNF to Skull Valley and then move it to the national repository would be:

$$(4.26 \times 10^{-8} \text{ injuries/railcar-km}) \bullet (34.8 \times 10^{6} \text{ railcar-km}) = 1.48 \text{ injuries, and}$$
$$(2.27 \times 10^{-8} \text{ fatalities/railcar-km}) \bullet (34.8 \times 10^{6} \text{ railcar-km}) = 0.78 \text{ fatalities}$$

over the 40 year assumed lifetime of the proposed PFSF. Because these are very small risks over the assumed 40-year life of the proposed facility, the staff finds these potential impacts to be small.

Saricks and Kvitek (1994) also noted that dedicated trains—such as would be used to transport spent nuclear fuel—spend much less time in rail yards than do regular trains, since dedicated trains do not undergo classification; thus, it appears that the injuries and fatalities based on national averages are not as relevant for dedicated trains as they are for regular trains. Should the large portion of casualties which occur in rail yards be excluded from the national averages, the injury rate would decrease by a factor of almost 7 and the fatalities would decrease by a factor of about 36.

5.7.1.3 Latent Health Effects

The cross-country shipment of SNF could involve non-radiological health risks associated with the generation of air pollutants by the vehicles during shipment, independent of the nature of the type of cargo being shipped. The health endpoint assessed under routine transport conditions is the risk of excess (additional) latent mortality caused by inhalation of vehicular exhaust emissions. The risk factor for latent mortality from pollutant inhalation, as generated by Rao et al. (1982), is 1.3×10^{-7} latent fatalities per train-km for rail transport in urban areas. This risk factor is based on regression analyses of the effect of sulfur dioxide and particulate releases from diesel exhaust on mortality. Vehicle-related risks from routine transportation are calculated for each case by multiplying the total distance traveled in urban areas by the appropriate risk factor. Similar risk factors are not available for rural and suburban areas.

If it is assumed that the total population along the rail routes is "urban," then the total indirect risk to the public from the non-radiological impacts of SNF transportation can be computed as:

$$(1.3 \times 10^{-7} \text{ latent fatalities/train-km}) \bullet (34.8 \times 10^{6} \text{ railcar-km}) \div (4 \text{ railcars per train}) = 1.14 \text{ latent fatalities.}$$

Because this is a very small risk over the assumed 40-year lifetime of the proposed facility, the staff finds this impact to be small.

5.7.2 Radiological Impacts

The radiological impacts of incident free (SNF shipments that do not involve accidents) SNF transport would include exposure of the public and the workers to ionizing radiation, thereby resulting in members of the general public and the transportation workers (e.g., the train crew) receiving a radiation dose. The impacts from potential accidents could result in additional radiological exposure. The radiological impacts of spent fuel transportation presented in this section include estimates of dose from incident-free transportation and from potential transportation accidents.

Incident-free risks of transporting SNF are dependent on the characteristics of the shipping casks (e.g., dimensions and surface dose rates), the number and length of shipments, the vehicle speed, and the population densities along the travel routes. Accident risks are dependent on the severity and likelihood of potential accidents, and the amount of radioactive material that could be released as a result of an accident. During incident-free transportation, the crew and some people along the transportation routes (for example, people near the rail lines or traveling on them) can receive radiation exposure because a small amount of radiation, within regulatory limits, emanates through the walls of loaded spent fuel shipping casks. A severe transportation accident could create forces large enough to damage a cask, causing a release and dispersal of radioactive material or an increase in the amount of radiation emanating through the cask walls through loss of cask shielding. In looking at the impacts of transportation accidents, NRC considers both the likelihood of an accident severe enough to damage a cask and the radiological consequences of such an accident.

In this DEIS computer analyses were used to assess both the incident-free and accident-related radiological impacts for cross-country transportation (i.e., from reactor sites to PFSF) and pursuant to 10 CFR 72.108 regional transportation. The regional transportation analysis assesses the possible radiological impacts along the five routes within the State of Utah that could be used to transport SNF to the proposed PFSF. The results of the regional analysis are summarized in Section 5.7.3 and discussed in detail in Appendix D. The analyses consider both local transportation alternatives discussed in Section 2.2.4. To assess the significance of the transportation activities related to the proposed action, the results and findings are compared to those of NUREG-0170, *Final Environmental Statement on the Transportation of Radioactive Material by Air and Other Modes*, December 1977. All SNF shipments to the proposed PFSF would be from commercial nuclear power plants and, therefore, would be subject to NRC and DOT transportation regulations.

The staff finds that the radiological impacts from the transport of SNF to the proposed PFSF are small. A summary of the staff's evaluation and results are presented below.

5.7.2.1 Summary of Findings

This section summarizes the results of the cross-country transportation analyses performed for this DEIS. Details of the analyses that were performed are presented in later sections. Results are presented in comparison to those of NUREG-0170. NUREG-0170 is used by NRC and the DOT as a basis for the adequacy of the regulations governing radioactive materials transportation (10 CFR Part 71 and various parts of 49 CFR). The annual radiological impacts of transportation calculated in this study and NUREG-0170 are summarized in Tables 5.5, 5.6, and 5.7. It should be noted that comparing the LCF predictions from NUREG-0170 and this analysis are not straightforward because different models were used to estimate the values. However, the results from both studies show that the estimated LCFs associated with the transport of SNF would be small.

Table 5.5. Annual incident-free SNF transportation doses[a]

	Number of shipments per year	Incident-free [person-Sv (person-rem)]	
		Rail	ITF
Reactor site to proposed PFSF	200	0.104 (10.4)	0.23 (23)
Proposed PFSF to final repository[b]		0.00298 (0.298)	0.069 (6.9)
NUREG-0170	652	2.98 (298)	—

[a]Includes doses to the public, transportation workers, and workers handling fuel at the ITF.
[b]Evaluates transportation impacts from the proposed PFSF to the Utah-Nevada border.

Table 5.6. Annual expected latent cancer fatalities (LCFs) for incident-free SNF transport

	Number of shipments per year	Incident-free risk (LCF)	
		Rail	Intermodal
Proposed PFSF	200	5.08×10^{-3}	1.02×10^{-2}
NUREG-0170[a]	652	3.60×10^{-2}	—

[a]Based on the estimates in NUREG-0170 that 1 percent of the LCFs from transportation of all radioactive material would occur from rail shipment of SNF.

Note: Includes doses to the public, transportation workers, and workers handling fuel at the ITF.

Table 5.7. Annual expected latent cancer fatalities (LCFs) for potential accident risk to the public during SNF transport

	Number of shipments per year	Accident risk (LCF)	
		Rail	Intermodal
Proposed PFSF	200	2.12×10^{-3}	2.12×10^{-3}
NUREG-0170[a]	652	8.00×10^{-1}	—

[a]Based on the estimates in NUREG-0170 that 1 percent of the LCFs from transportation of all radioactive material would occur from rail shipment of SNF.

Based upon the assessments and results performed for this DEIS, the NRC concludes that the radiological doses from transportation of SNF, by rail only or via the ITF, from existing reactor sites to the proposed PFSF and from PFSF to a permanent repository are small. Further, the results indicate that the estimated doses resulting from shipments of SNF to the proposed PFSF are a small fraction of the doses reported in NUREG-0170.

5.7.2.2 Approach to Analysis

The approach of this analysis is to estimate the magnitude of the annual radiological doses resulting from transport of SNF to the proposed PFSF. To complete the analysis, the potential radiological impacts from incident-free transport and potential transportation accidents associated with shipping SNF to and from the proposed PFSF were conservatively estimated. Those results were then examined to determine if the impacts of the transportation to and from the proposed PFSF were consistent with the results of NUREG-0170. See Section D.2 in Appendix D.2 of this DEIS for a brief discussion of NUREG-0170.

In this analysis, the RADTRAN4 computer code (Neuhauser 1992) was used to model both the incident-free radiological exposure and the consequences of radiological releases due to severe accidents. The route and population density numbers used by RADTRAN4 were generated by the INTERLINE computer code to estimate the impacts of shipping SNF to and from the proposed PFSF. Future changes in the population density were considered in estimating the impacts from shipping SNF to and from the proposed PFSF. Appendix C discusses the INTERLINE route analyses and Appendix D discusses the RADTRAN4 analyses. The human health risks of the radiological exposures are expressed as LCF values. (See Section 3.7 for the definition of LCF.) Radiation-dose-to-cancer-risk factors from NAS (1990) [i.e., 5×10^{-6} LCF/Sv (5×10^{-4} LCF/rem) for the general public and 4×10^{-6} LCF/Sv (4×10^{-4} LCF/rem) for workers] were used to estimate the LCF values.

As discussed below, this analysis used inputs that conservatively estimate the impacts associated with the number of SNF transports that might occur if the proposed PFSF is licensed and begins operations. Many “conservative” assumptions were used in this DEIS assessment, as set forth below, to provide reasonable assurance that the impacts of the actual activity, if it occurs, are overestimated.

In the RADTRAN4 computations used to support this DEIS, the accident categories, event trees, and release fractions developed in NUREG/CR-4829, *Shipping Container Response to Severe Highway and Railway Accident Conditions*, February 1987, (frequently referred to as the Modal Study) were used. The Modal Study was conducted by Lawrence Livermore National Laboratory in support of NRC's efforts to further examine the level of safety provided by its regulations with respect to accident conditions. The Modal Study also examined transport cask response to accidents by using computer modeling of generic cask responses to accident forces. The Modal Study results indicated that annual SNF shipment risks were about one-third those estimated in NUREG-0170. The NRC staff concluded from the Modal Study that NUREG-0170 clearly bounded spent fuel shipment risks.

5.7.2.3 Assumptions for this Analysis as Compared to NUREG-0170

Route and shipment parameters. Table 5.8 describes attributes of the generic routes used in NUREG-0170 and the route used in this DEIS. The radiological impacts for both incident-free transportation and for possible transportation accidents are sensitive to these variables, particularly route length, so choosing a route that tends to maximize them is a conservative approach. The majority of the fuel (over 90 percent) would arrive at the proposed PFSF from eastern reactor sites. In order to develop an estimate of the total risk of cross-country shipments of SNF to the proposed PFSF, NRC has taken a very conservative assumption that all 40,000 MTU of SNF would be shipped to the PFSF from the Maine Yankee plant, 16 km (10 miles) north of Bath, Maine. The route selected for this analysis is 4,476 km (2,781 miles) in length (see Figure 5.1) and passes through large population centers of Schenectady, New York; Buffalo, New York; Cleveland, Ohio; Toledo, Ohio; Gary, Indiana; Chicago, Illinois; Ogden, Utah; and Salt Lake City, Utah. The route is described in detail in Appendix C. Using this cross-country route in the transportation analysis results in a conservative estimate of the national transportation impacts of the proposed action. As compared to NUREG-0170, this route is much longer and assumes a much larger number of people are exposed to each SNF shipment. The annual number of exposures (as measured by the number of casks times the population along the route) are not significantly different (181,088,436 for NUREG-0170 and 224,647,600 for this study) because NUREG-0170 assumed 652 cask shipments as opposed to only 200 cask shipments, which is the annual maximum for PFS.

If the proposed rail line from the Union Pacific mainline at Skunk Ridge were not constructed to the proposed PFSF, an ITF would be constructed near the Timpie siding. Heavy-haul vehicles would use Skull Valley Road to move the SNF casks from the ITF to the proposed PFSF site. The rail route from Maine Yankee to the ITF would be nearly identical to the route described for all rail shipment between Maine Yankee and the proposed PFSF, except the route would terminate at the Timpie siding. This route is 4,389 km (2,727 miles) long. The heavy-haul route from the proposed ITF near Timpie to the proposed PFSF site is 42 km (26 miles) long.

An additional assessment was performed for shipments from the proposed PFSF to a permanent repository at Yucca Mountain, Nevada. Because Congress has directed DOE to study only Yucca Mountain as the potential repository, this analysis uses an assumption that all SNF would be transported from the proposed PFSF to the Utah-Nevada border on the way to the repository. Future population estimates were used in this assessment. The assumption was that shipments would leave the PFSF via rail and travel through Black Rock, Utah to the Nevada border (see Figure 5.2). This route was selected because it is the most direct and therefore the most likely route to be used

Table 5.8. Spent fuel route data as used in this analysis and in NUREG-0170[a]

Parameter	Maine Yankee to PFSF: Rail to PFSF	Maine Yankee to PFSF: Rail to ITF[b]	NUREG-0170 rail route
Route length (km)	4,476	4,431	1,210
Urban fraction	0.043	0.044	0.05
Suburban fraction	0.23	0.24	0.05
Rural fraction	0.73	0.72	0.9
Population densities (people/km^2)			
Urban	2,552	2,552	3,861
Suburban	335	335	719
Rural	9	9	6
Population assumed exposed per shipment (number of people)			
1990 population	864,029		NA
Estimated population in 2020[c]	1,123,238		NA
NUREG-0170 (1985)	NA		277,743
Shipments per year (single cask)			
Maine Yankee to PFSF	50[d]		NA
NUREG-0170	NA		652

[a]To convert kilometers to miles, multiply by 0.62. To convert people per square kilometer to people per square mile, multiply by 2.59.

[b]The 42 km between the ITF and the PFSF is all rural with a density of 1.3 people per km^2.

[c]Calculated as a 30-percent increase in the 1990 population..

[d]At four casks per shipment.

to ship SNF from the PFSF to Yucca Mountain. Shipment plans within Nevada are subject to decisions of the DOE that have not yet been made (for example, the locations of intermodal transfer points or new direct-access rail lines to Yucca Mountain). DOE is analyzing the national and Nevada-regional transportation impacts of building and operating a repository at Yucca Mountain (DOE DEIS 1999).

Future population growth. All RADTRAN calculations were carried out using population density information from the U.S. Census Bureau for the year 1990, the latest year for which detailed census information exists. That information provides not only data on the number of people all over the United States, but also identifies where they live. Since that time, the U.S. population has grown, and this growth is expected to continue. Currently the U.S. Census Bureau has projected growth in the country to the year 2100, but obviously data are not available as to where the new people will live. To account for the population increase on cross-country routes to the proposed PFSF, the population exposures generated by RADTRAN have been multiplied by the ratio of the population projected for the year 2020 to the actual population in the year 1990. Information from the U.S. Census Bureau indicates that with an average growth rate, the population of the United States will reach 325 million in the year 2020. Since the U.S. population was 250 million in 1990, the projected

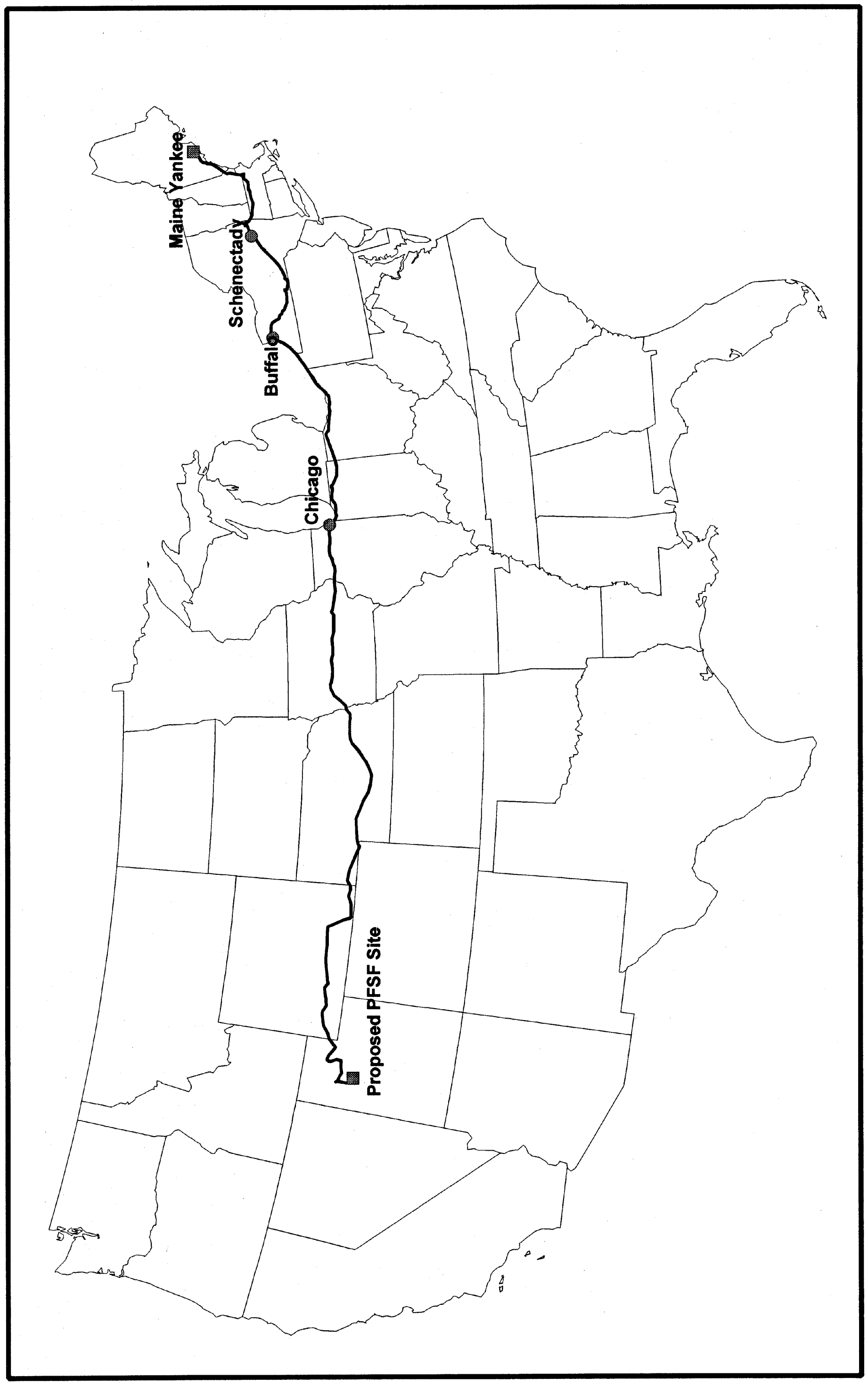

Figure 5.1. Rail route from the Maine Yankee nuclear power plant to the proposed PFSF in Skull Valley, Utah.

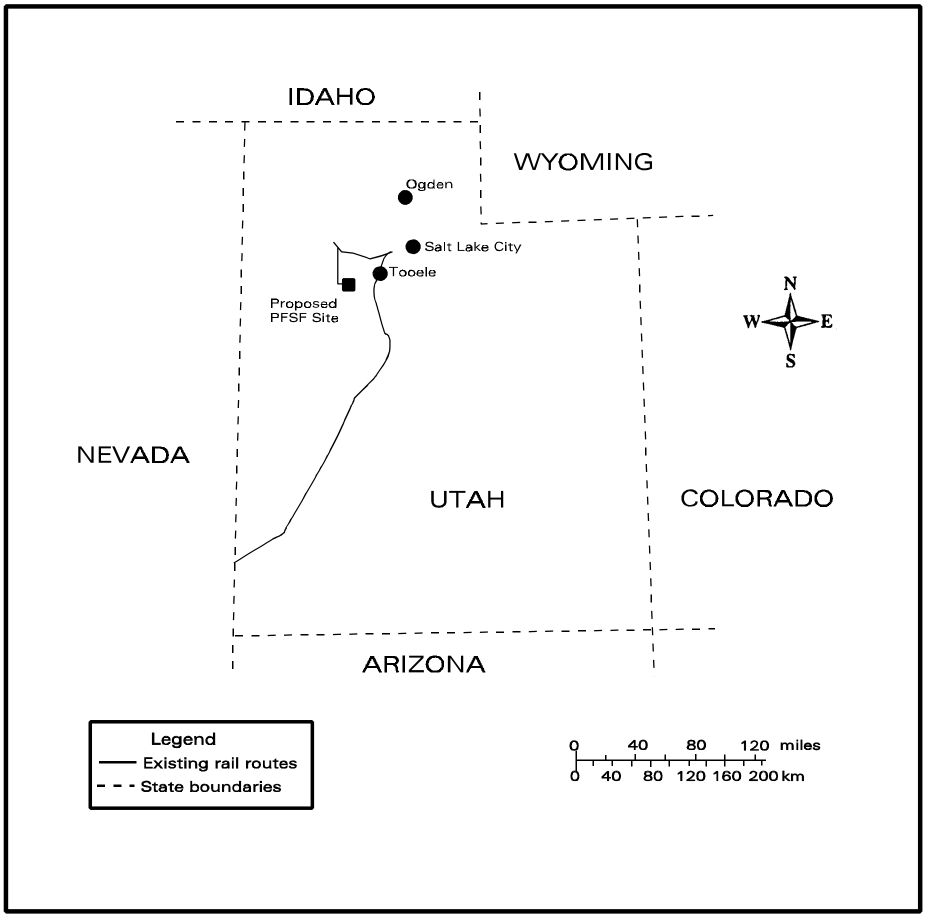

Figure 5.2. Rail route for shipping SNF from Skull Valley, Utah, toward a national repository. 1

increase is 325/250, or 30 percent. The number of people exposed during shipments of SNF to the proposed PFSF have been increased by 30 percent to account for population growth. Using the 1990 Census data, it is estimated that 864,029 people would live along the rail route from Maine Yankee to the proposed PFSF. Considering the 30-percent increase, it is projected that 1,123,238 people would live along the route from the Maine Yankee to the proposed PFSF. Both of these populations are much larger than the population (277,743 people) considered in NUREG-0170.

In 1990 the population of Utah was approximately 1.72 million. Based on U.S. Census Bureau information projected out to the year 2040, the state should reach a population of approximately 3.38 million, or approximately twice the 1990 population. Therefore, the data generated by RADTRAN4 for shipments from the PFSF to a permanent geological repository was multiplied by two to account for the increase in population at the time when these shipments would be made.

PFS estimates that the PFSF would receive approximately 200 casks per year. PFS also indicated that each train would average four casks; therefore, the proposed PFSF is expected to receive 50 train shipments per year. To examine the radiological impacts on the public and the crews used to ship and handle the casks, RADTRAN4 was used to calculate the impact on the public assuming that all 200 casks are shipped, one cask per train. This maximizes the radiological impact to the public and more closely resembles the way multiple casks on a train are arranged. That is, cask-carrying railcars probably would be separated by buffer cars; thus, each railcar becomes more of a separate radiation source to the public. The dose received by the train crew was similarly evaluated assuming one cask was shipped on each train and the results were multiplied by 200 shipments to obtain an annual exposure to the crew.

Package inventories and dose rates. Incident-free radiological exposure was estimated by calculating a total body dose for the transport crew and the general population from the radiation dose rate at 1 m (about 3 ft) from the package surface. Both point-source and line-source approximations were used based upon the distance between the exposed individuals and the radiation source. Because of the specific radionuclide content of PWR fuel assemblies and the number of assemblies inside each cask, PWR assemblies would produce a greater dose than BWR fuel assemblies in the event of an accident that breaches the cask. Accordingly, the staff performed the analysis based on PWR fuel. Each cask is assumed to contain 24 PWR fuel assemblies with a burnup of 40,000 MW-day/MTU and that have been cooled for 5 years. Each cask was assumed to have a dose rate of 0.13 mSv/hr at a distance of 1 m (13 mrem/hr at 3 ft) from the cask surface, which is equivalent to the regulatory limit of 0.1 mSv/hr at 2 m (10 mrem/hr at 6.5 ft). The source term was assumed to consist entirely of gamma radiation for calculation of the incident-free dose. NUREG-0170 assumed that a rail cask would carry no more than 7 PWR assemblies, and that the cask dose rate was 0.1 mSv/hr at 2 m (10 mrem/hr at 6.5 ft). Actual dose rates are expected to be lower than the regulatory limit for most casks.

Accident release fractions and release fraction probabilities. The risk associated with radiation exposure from releases of radioactive material in transportation accidents can be represented as the product of the probability of an accidental release and the consequences of the release (DOT 1998). Radiological consequences of accidents are calculated by assigning package release fractions for each of a set of 6 accident severity categories. The release fraction is defined as the fraction of the radioactive material in the package that could be released from that package during an accident of a certain severity. The accident probabilities and release fractions used in this analysis are different from those used in NUREG-0170. The accident probabilities and release fractions used in this DEIS are based on the Modal Study. The NRC staff believes that this source provides more realistic estimates of the accident probabilities and release fractions.

In March 2000, an NRC contractor report, NUREG/CR-6672, *Reexamination of Spent Fuel Shipment Risk Estimates*, was published. This report reexamined the risk associated with the transport of SNF. Cask and SNF response to collision impacts and fire were evaluated by performing three-dimensional, finite element (structural) and one-dimensional, heat transport calculations. Accident release fractions and accident severity fractions were developed to calculate the radiological risk (accident dose) from accidents. The accident dose risk was compared to dose risk calculated using NUREG-0170 and the Modal Study accident source terms. The comparison demonstrates that both studies made a number of very conservative assumptions about SNF and cask response to accident conditions, which caused their estimates of accident source terms, accident frequencies, and accident consequences to be very conservative.

5.7.2.4 Incident-Free and Accident Dose Risks from SNF Shipments to the Proposed PFSF

The dose results for the cross-country transportation analysis in this DEIS are discussed below. Presented first are the incident-free and accident dose estimates assuming SNF is transported from a typical reactor site (for the purposes of analysis: the Maine Yankee Plant) to the proposed PFSF by rail along the new Skunk Ridge rail line. This section then presents the incident-free and accident dose risk estimates assuming the SNF is shipped via the alternative of an ITF near Timpie. For this alternative, SNF would first be transported by rail to the siding at Timpie (i.e., the ITF) and then by heavy-haul vehicle down Skull Valley Road to the proposed PFSF.

Shipments to the Proposed PFSF Via Rail

Incident-free doses. Incident free doses were calculated for the general public, the train crew, and the MEI. The MEI is defined as an unshielded individual that is hypothetically positioned 30 m (98 ft) from the highway or railroad track with no intervening objects that would provide shielding, and the conveyance transporting the radioactive material considered in the analysis is modeled as passing by the MEI at a speed of 24 km/hr (15 mph). This MEI is assumed to be present at this unshielded location for the entire inventory of shipments to the PFSF (200 shipments per year for 20 years).

Table 5.9 presents the dose commitments for a one-year period and over the 20 year shipping campaign to transfer 4,000 canisters to the PFSF. Based on the analysis in this DEIS, the general public (approximately 1 million people) along rail route from a reactor site to PFSF would receive approximately 0.0918 person-Sv (9.18 person-rem) annually from the transport of 200 SNF casks to PFSF. This would result in a dose of 1.84 person-Sv (184 person-rem) over the 20-year campaign. The crew (two people per shipment) would receive a dose of 0.0122 person-Sv (1.22 person-rem) annually, and 0.244 person-Sv (24.4 person-rem) over the 20 year campaign.

These numbers are considered conservative since each shipment was projected to travel a distance equivalent to that between the Maine Yankee reactor and the PFSF, passing through significant population centers. Future U.S. population growth was accounted for by increasing population exposure by 30 percent, which would be approximately equivalent to making all shipments in the

Table 5.9. Incident free dose for SNF shipment from Maine Yankee to the proposed PFSF via rail

Dose [person-Sv (person-rem)]		Maximally exposed individual dose [Sv (rem)]	Risk (LCF)	
Transportation crew	Public		Transportation crew	Public
Annual—200 casks per year				
0.0122 (1.22)	0.0918 (9.18)	1.10×10^{-6} (1.10×10^{-4})	0.000488	0.00459
20-year campaign—4,000 casks				
0.244 (24.4)	1.84 (184)	2.2×10^{-5} (2.2×10^{-3})	0.00976	0.0918

year 2020. Based on this analysis, over 1 million people would share 0.0918 person-Sv (9.18 person-rem) from SNF shipments to the PFSF. This is about 9.18×10^{-5} mSv (0.00918 mrem) per person annually, or 0.00184 person-SV (0.184 person-mrem) for an individual exposed to this level of radiation every year over the entire 20-year shipping campaign. The corresponding LCF risks for the general public and the transportation crew are also presented in Table 5.9. The annual and 20-year campaign LCF risks for the MEI are 5.5×10^{-8} and 1.1×10^{-6} (or about one chance in 18 million and one chance in 1 million), respectively.

Accidents. To transport 200 casks per year, PFS has indicated that on average there would be 50 rail shipments carrying four casks each. A major factor in determining the consequences of an accident is the amount or fraction of radioactive respirable material released during an accident. With four casks per shipment, the amount of material released is dependent on the response of each cask to a given accident. For a train carrying only one SNF cask, estimates have been made of the likelihood that the cask will release material during an accident of a given severity. Therefore, in this analysis, these estimates were used and it was assumed each of the four casks was damaged and released material to the same extent; this should provide an upper bound to the results of the accident scenario.

For all rail shipments to the proposed PFSF, the accident dose risk was estimated to be 0.0423 person-Sv (4.23 person-rem) annually and 0.84 person-Sv (84.6 person-rem) for the entire 20-year campaign. This equates to an accident dose risk of 0.00085 person-Sv (0.085 person-rem) per shipment. The LCF risks for the annual and 20-year campaign calculated exposures are 0.00212 and 0.042, respectively.

The four casks are widely separated from each other on the train (usually by a buffer car between each cask-carrying railcar) and are unlikely to experience the same forces in an accident. Accordingly, and notwithstanding that specific estimates have not been made, it would be reasonable to expect that in an accident, all four casks would not be damaged to the extent that each one would release material and provide a source of radiation exposure to the public. If only one of the four casks were damaged to the extent radiological material was released, the dose risks to the public as presented in the preceding paragraph would be further reduced by a factor of about 3.58 to 0.0118 person-Sv (1.18 person-rem) annually and 0.24 person-Sv (24 person-rem) for the entire 20-year campaign. This equates to an accident dose risk of 0.000236 person-Sv (0.0236 person-rem) per shipment. The NRC staff believes a reasonable estimate of the risk is somewhere between the two estimates but closer to the estimate for the release from a single cask. In any event, the radiological risk from an accident during the rail transport of SNF is small.

Shipments to the Proposed PFSF Via ITF

Incident-free doses. If the new rail line is not built from Skunk Ridge, the Timpie siding is the assumed location on the Union Pacific rail line at which an intermodal transfer facility (ITF) would be built. The ITF is the facility at which the transfer of SNF shipping casks from rail to truck would take place. Transportation of SNF to the proposed PFSF via an ITF near Timpie can be divided into three major phases. The first phase is to transport SNF from the reactor site to the ITF near Timpie. PFS has indicated that this phase would take place using rail only. The second phase is to transfer the SNF from a railcar to a heavy-haul vehicle at the ITF. Finally, the SNF would be transported down Skull Valley Road using the heavy-haul vehicle to the proposed PFSF.

Table 5.10 provides estimates of the annual and 20-year campaign incident-free doses to the transportation crew, the general public, and the MEI for the ITF alternative. In general, comparing Tables 5.9 and 5.10, the ITF alternative results in additional worker impacts due to greater handling, but has very little effect on the impacts to the general public. Table 5.10 also presents the LCF risks to the crew and general public from exposure to the annual and 20-year campaign doses. The LCF risks to the MEI from exposure to the annual and 20-year campaign doses are 5.5×10^{-8} and 1.1×10^{-6} (or about one chance in 18 million of developing a fatal cancer from one year of operation and one chance in 1 million of developing a fatal cancer from 20 years of operation), respectively. The summary below describes how each phase of the transportation contributes to the totals displayed in Table 5.10.

Table 5.10. Incident free dose for SNF shipment from Maine Yankee to the proposed PFSF via an ITF near Timpie, Utah

Dose [person-Sv (person-rem)]		Maximally exposed individual dose [mSv (mrem)]	Risk (LCF)	
Transportation crew	Public		Transportation crew	Public
		Annual—200 casks per year		
0.137 (13.7)	0.0941 (9.41)	1.1×10^{-6} (1.1×10^{-4})	0.00544	0.0047
		20-year campaign—4,000 casks		
2.73 (273)	1.88 (188)	2.2×10^{-5} (2.2×10^{-3})	0.109	0.0942

Shipments from the reactor sites to the ITF via rail. The shipment of casks to the ITF generates almost identical dose commitments to the train crew and the public at large as did the shipments moving all the way to the PFSF assuming the Skunk Ridge rail connector line was built. This is because the distance from Maine Yankee to the ITF (4431 km [2747 miles])is only slightly less than the distance from Maine Yankee to the proposed PFSF [4476 km (2775 miles)]. Table 5.11 presents the projected dose received by the train crew and the population for the shipments to the ITF at the Timpie siding.

Table 5.11. Incident free dose for SNF shipment from Maine Yankee to the ITF via rail

Dose [person-Sv (person-rem)]			Risk (LCF)	
Transportation crew	Public	Maximally exposed individual dose [Sv (rem)]	Transportation crew	Public
		Annual—200 casks per year		
0.0121 (1.21)	0.0917 (9.17)	1×10^{-6} (1.10×10^{-4})	0.000484	0.00459
		20-year campaign—4,000 casks		
0.242 (24.2)	1.83 (183)	2.2×10^{-5} (2.2×10^{-3})	0.00968	0.915

SNF transfer at the ITF. Once the fuel is received at the ITF, the cask transfer activities that are expected to take place at that facility include radiation monitoring, release of the package tiedowns from the railcar, hoisting the cask off of the railcar with a crane and moving it to the heavy-haul trailer, and re-securing the cask to the trailer. The remaining casks would be held on the railcars until the heavy-haul trailer and escorts return to pick up each of the remaining casks.

At the ITF the crew would consist of four handlers and a spotter, an inspector, a crane operator and a health physics staff member. These workers would be employees of PFS and are the same workers that would be involved in unloading the cask and inspection (i.e., Type 1 and Type 2 workers) and maintenance at the proposed PFSF (see Section 4.7). The handlers would attach ropes to the ends of the cask after it is released from the railcar and help guide it into a tie-down cradle on the low-boy trailer or to the temporary storage location. The spotter would give directions to the crane operator and the handlers. The inspector would ensure that all written procedures are followed. The health physics staff member would monitor the movement and check the cask external surface doses.

The assumptions and methods for estimating the dose received by the ITF crew is part of the RADTRAN4 code and has been used to estimate the dose received by handlers and inspectors in an intermodal transfer of SNF shipping casks (Neuhauser and Weiner 1992). Using similar exposure times, the total dose received by the eight ITF workers is estimated to be 0.119 person-Sv/yr (11.9 person-rem/yr), or 2.38 person-Sv (238 person-rem) over the entire 20-year campaign of shipping SNF to Skull Valley. Details of this analysis are presented in Appendix D.

Truck shipments via Skull Valley Road. Use of an ITF located near Timpie would require that SNF casks be shipped the last 41 km (26 miles) to the proposed PFSF by heavy-haul vehicle. A rail siding and cask handling equipment will be available at the ITF site. Assuming the PFSF receives 200 casks per year, the ITF would transfer, on the average, four casks each week, and these casks are likely to come in on 1 to 2 trains for each 7-day period. One of the casks would be transferred from its railcar onto a heavy-haul trailer (see Figure 2.8). The other casks would remain on the railcars.

Shipments from the ITF to the proposed PFSF would be made only during the daylight hours. Each truck shipment to the PFSF would be accompanied by escorts: one vehicle in front and one at the rear of the heavy-haul tractor/trailer in accordance with Utah Department of Transportation Regulations for Legal and Permitted Vehicles, Section 600. The heavy-haul vehicle is expected to travel at a speed of about 32 km/hr (20 mph) over the 41 km (26-mile) road to the PFSF. The trip will take approximately 1.5 hours. It is anticipated that the two pilot/escort vehicles will travel up to 300 m (1,000 ft) ahead of and behind the heavy-haul vehicle to warn travelers of the slow moving truck. Once unloaded, the heavy-haul vehicle and escorts can return to the ITF and pick up the next cask. RADTRAN4 was used to estimate the doses to the workers involved with transporting the SNF from the ITF to the proposed PFSF. Dose calculations for these intermodal shipments are discussed below and the exposure data are presented in Table 5.12.

Table 5.12. Incident free doses for SNF shipment from the ITF to the PFSF via heavy-haul vehicle

Crew dose[a] [person-Sv (person-rem)]	Population dose[b] [person-Sv (person-rem)]	MEI dose [mSv (mrem)]	Risk (LCF)	
			Transportation crew	Public
Annual dose, 200 casks per year[c]				
0.006 (0.6)	0.0024 (0.24)	1×10^{-6} (1×10^{-4})	0.00024	0.00012
20-year life campaign[c]				
0.12 (12.0)	0.0472 (4.72)	2×10^{-5} (2×10^{-3})	0.0048	0.00236

[a]Assumes one driver and a dose rate of 0.02 mSv/hr (2.0 mrem/hr) in the cab; also includes exposure to four escorts
[b]The population doses have been increased by 61 percent to account for projected population increases in Utah between 1990 and 2020.
[c]Assumes 1 cask per low-boy shipment transported 41.8 km (26 miles).

Assuming there would be one driver in the truck and the dose rate in the cab is at the maximum U.S. DOT limit of 0.02 mSv/hr (2 mrem/hr), the dose to the driver would not exceed 0.03 mSv (3 mrem) for each trip. PFS could provide some small amount of additional radiation shielding for the driver, which would reduce the driver’s dose to a fraction of this amount. The PFSF driver(s) would make 200 such shipments each year. Conservatively, the total accumulated dose to the drivers of the tractor would not exceed:

(200 shipments/yr) • (0.03 mSv/shipment) = 6 mSv/yr (600 mrem/yr).

This translates to a maximum cumulative dose of 0.12 person-Sv (12 person-rem) for a 20-year campaign.

If the escorts drive an average of 240 m (800 ft) in front of and behind the shipping cask on the heavy-haul trailer, the dose rate in their vehicles, assuming no intermediate shielding such as the body of the vehicles they are riding in or the cab of the heavy haul truck, should not exceed 2×10^{-6} mSv/hr (0.0002 mrem/hr) (see Figure D.1 in Appendix D of this EIS). If there are two escorts in each vehicle, the four escorts would receive:

(200 shipments/yr) • (4 escorts/shipment) • (2×10^{-6} mSv/hr per person) • (1.5 hr/shipment) = 0.0024 person-mSv/yr (0.24 person-mrem/yr).

This translates to a maximum cumulative dose of 0.048 person-mSv (4.8 person-mrem) to the escorts for the 20-year campaign.

Information from Tables 5.11 and 5.12 has been combined with the total dose received by the ITF crew and is presented in Table 5.10. Table 5.10 summarizes the total dose both to the working crews and the population if the ITF were used to transport SNF to the proposed PFSF. By comparing Table 5.9 with Table 5.10 it is apparent that when SNF is shipped using the ITF, the dose to the crew increases about a factor of 11 over the 20-year shipping campaign [compare 0.244 person-Sv (24.4 person-rem) with 2.73 person-Sv (273 person-rem)]. However, intermodal shipments have only a minor affect on the dose received by the population in general [1.84 person-Sv (184 person-rem) using the Skunk Ridge rail line vs. 1.88 person-Sv (188 person-rem) using the ITF] because most of the exposure to the public occurs on the cross-country rail portion of the shipment which is almost the same whether the rail shipment stops at Timpie or is carried all the way to the PFSF.

Accidents. Accident dose risk for the transport of SNF from operating reactors to the proposed PFSF via the ITF would be similar to the accident dose risk discussed above for the shipments via the Skunk Ridge rail line because the largest contributor to the risk is associated with the cross-country shipment of SNF from the reactor sites to the ITF. However, additional accident dose risk is associated with the transport of SNF down Skull Valley Road. Using RADTRAN4, the accident dose risk from shipments down Skull Valley Road was determined to be 1.08×10^{-5} person-Sv (0.00108 person-rem) annually. For the 20-year campaign, this dose risk would be 0.00022 person-Sv (0.022 person-rem). This is equivalent to an LCF of 1.1×10^{-5} or about one chance in 93,000 that any individual exposed along Skull Valley Road would develop a fatal cancer from this level of exposure. These dose risk estimates reflect the expected increase in the Utah population from 1990 to 2020.

5.7.2.5 Incident-Free and Accident Dose Risks from Shipments to a Final Repository

The SNF would remain at the proposed PFSF for a number of years, after which it would be removed and transported to the final repository. This section examines the radiological risk of transporting all 4,000 SNF canisters from the proposed PFSF to the Utah-Nevada border.

For the purposes of analysis, it is assumed that the oldest SNF would be shipped to the permanent repository first, and the SNF in the canisters would have been cooled at least 20 years. It was also assumed that the shipping casks designed to bring the canisters to the PFSF would be used to ship them to the repository. This will (1) avoid the cost of designing, certifying, and fabricating new casks, (2) reduce potential handling activities, and (3) have the additional benefit of reducing the dose rate from the cask because of the decay of many of the isotopes that would be inside the canisters. Comparing 5-year-old fuel with 20-year-old fuel with the same burn-up, the radioactivity of the most significant isotopes will be reduced by a factor of two. To a first approximation, the dose rate is assumed to be reduced by this same ratio, i.e., to 0.065 mSv/hr (6.5 mrem/hr) at a distance of 1 m (3.3 ft) from the cask surface. However, the population of Utah is expected to increase about a factor of two from 1990 (at 1.72 million) to 2040 (projected to be 3.38 million), by which time the removal of casks from the proposed PFSF should be complete. The net result of reducing the external dose rate from the packages and increasing the population density is presented in Table 5.13 for a one-year campaign of transporting 200 casks and the 20-year campaign to remove all 4,000 casks by rail using the Skunk Ridge route.

Table 5.13. Annual and cumulative 20-year campaign radiation doses associated with SNF shipment from the proposed PFSF to the Utah-Nevada border via rail

Incident-free dose [person-Sv (person-rem)]		Maximally exposed individual dose [Sv (rem)]	Accident dose risk to public [person-Sv (person-rem)]
Transportation crew	Public		
		Annual—200 casks per year	
0.00218 (0.218)	8.0×10^{-4} (0.080)	5.5×10^{-7} (5.5×10^{-5})	2.23×10^{-4} (0.0223)
		20-year campaign—4,000 casks	
0.0436 (4.36)	0.0160 (1.60)	1.1×10^{-5} (1.1×10^{-3})	4.46×10^{-3} (0.446)

For the ITF alternative, the SNF would be shipped in the same casks in which the fuel was originally delivered to the PFSF and the first leg of the journey would be by heavy haul truck from the PFSF to the ITF at the Timpie rail siding. The SNF would then be loaded on a Union Pacific train for the rail portion of the trip. As described above, the fuel would have been cooled for a minimum of 20 years, and its external dose rate would have decreased by about a factor of two. Accordingly, the dose to workers who handle the casks directly, such as those who work at the ITF, would be a factor of two less than the doses estimated for the incoming cask transfers at the ITF.

The last leg of this intermodal transportation scenario would be by train. The casks would be placed on a train, and for consistency, it is assumed that each train would handle four casks. Because the final route and mode of transportation are unknown at this time, this analysis assumes the SNF would be hauled to the Utah-Nevada border. A summary of the radiation dose results is given in Table 5.14. Note that the dose received by the transport crew in the intermodal shipment

Table 5.14. Annual and cumulative 20-year campaign radiation doses associated with intermodal SNF shipment from the PFSF to the Utah-Nevada border via an ITF near Timpie, Utah

Incident-free dose [person-Sv (person-rem)]		Maximally exposed individual dose [Sv(rem)]	Accident dose risk to public [person-Sv (person-rem)]
Transportation crew	Public		
		Annual—200 casks per year	
0.0669 (6.69)	0.00232 (0.232)	5.5×10^{-6} (5.5×10^{-4})	2.34×10^{-4} (0.0234)
		20-year campaign—4,000 casks	
1.34 (134)	0.0464 (4.64)	1.1×10^{-5} (1.1×10^{-3})	4.68×10^{-3} (0.468)

(Table 5.14) is higher than for the crew when the shipment is entirely by rail (Table 5.13). Approximately 90 percent of the crew's dose when using the ITF is a result of transferring each cask from a heavy-haul trailer to a railcar. There is also a slight increase in the dose received by the general population, primarily from the population exposure during the truck shipping phase.

Tables 5.15 and 5.16 show the risks (as measured by LCFs) of the campaigns to remove SNF from the proposed PFSF and send it to the Utah-Nevada border.

Table 5.15. Annual and cumulative 20-year campaign health risks associated with SNF shipment from the proposed PFSF to the Utah-Nevada border via rail[a,b]

Incident-free risk (LCF)[c]		Maximally exposed individual risk (LCF)	Accident risk to public (LCF)
Transportation crew	Public		
		Annual—200 casks per year	
8.72×10^{-5}	4.00×10^{-5}	2.75×10^{-8}	1.22×10^{-4}
		20-year campaign—4,000 casks	
2.72×10^{-3}	8.00×10^{-4}	5.50×10^{-7}	2.44×10^{-3}

[a]Each train would carry four casks and travel 570 km (354 miles) to the Utah-Nevada border.
[b]The number of LCFs presented here may be compared to the national average lifetime risk of death from cancer from all causes, which is approximately 0.25 (about 1 in 4).
[c]The crew size would be two persons for rail transport.

Table 5.16. Annual and cumulative 20-year campaign health risks associated with intermodal SNF shipment from the proposed PFSF to the Utah-Nevada border via an ITF near Timpie, Utah

Incident-free risk (LCF)			
Transportation crew	Public	Maximally exposed individual risk (LCF)	Accident risk to public (LCF)
		Annual—200 casks per year	
2.68×10^{-3}	1.16×10^{-4}	2.75×10^{-8}	1.17×10^{-5}
		20-year campaign—4,000 casks	
5.35×10^{-2}	2.32×10^{-3}	5.50×10^{-7}	2.34×10^{-4}

5.7.2.6 Utah and Regional Impacts

The impacts of transporting SNF in the region (i.e., considered to be in and near the state of Utah) were also analyzed in detail. To analyze the regional impacts, rail access routes and route lengths were selected to cross the Utah state borders, where possible, and to accommodate convergence points from rail lines farther away from the proposed PFSF. Five different access routes (see Figure 2.7) potentially could be used to reach the proposed site in Skull Valley, Utah. The actual distance of the identified routes varies from 330 km (220 miles) to 385 km (239 miles) due to the structure of the INTERLINE rail routing network. The characteristics of each of the five routes are described in Appendix C. It is not likely that any one route would be used to transport all 40,000 MTU. However, to present an upper bound of these impacts, each route was analyzed assuming that it was used to transport all 40,000 MTU. The radiological impacts from incident-free and accidents are found in Appendix D and are summarized below.

The highest impacts to the public would be associated with the rail routes passing through Salt Lake County. For SNF shipments to the proposed PFSF along the new rail line from Skunk Ridge, the highest incident-free dose to the public would be associated with the route to Skull Valley from Green River, Utah. The estimated annual dose to the public would be 0.00619 person-Sv (0.619 person-rem). This dose corresponds to an LCF of 3.1×10^{-4}. That is, SNF transportation by rail to the proposed PFSF site would involve one chance in 3200 that any member of the exposed population would develop a fatal cancer.

For a rail accident along the Green River route, the annual dose to the public would be 0.0022 person-Sv (0.222 person-rem). This dose would produce an annual LCF of 1.11×10^{-4}. That is, the accident would involve about one chance in 9,000 that any member of the exposed population would develop a fatal cancer.

If the ITF is constructed instead of the rail line from Skunk Ridge, the route from Green River would provide the highest doses to the public. The combined annual dose to the public for SNF shipments to the Timpie siding (from Green River) and heavy-haul along Skull Valley road would be 0.0083 person-Sv (0.83 person-rem). The dose from a rail accident along route from the Green

River would be the same as described above for the situation without an ITF, but with a new rail line from Skunk Ridge.

5.7.2.7 Sabotage

The current requirement contained in 10 CFR 73.37 for safeguarding shipments from acts of sabotage was promulgated in 1980 (see the dialogue box below). The requirements were based on analytical studies that estimated the consequences from credible sabotage events. Since sabotage is a deliberate malevolent act, a meaningful probability of likelihood cannot be assigned. Therefore, analyses of sabotage focus on the consequences of such an event.

The extensive security measures required by NRC regulations make sabotage events extremely unlikely. Moreover, the casks required to be used to transport SNF are designed to withstand very substantial impacts during transport without loss of containment integrity. The cask designs should further reduce the likelihood of release of radioactive material in the extremely unlikely event of sabotage. In view of the above, if a sabotage event that results in releases did occur, it is the judgement of the NRC staff that the consequences would not be unacceptably large.

PERFORMANCE OBJECTIVES FOR SNF PHYSICAL PROTECTION REQUIREMENTS

(1) minimize the possibilities of radiological sabotage of SNF shipments, especially within heavily populated areas; and

(2) facilitate the location and recovery of SNF shipments that may have come under the control of unauthorized persons.

To achieve these objectives, the physical protection shall:

(1) provide for early detection and assessment of attempts by unauthorized parties to gain access or control over SNF shipments,

(2) provide for notification to the appropriate authorities of any attempt to sabotage a SNF shipment, and

(3) impede attempts of radiological sabotage of SNF within heavily populated areas, or attempts to illicitly move SNF shipments into heavily populated areas until response forces arrive.

5.7.2.8 Conclusion

Because the analyses performed for this DEIS used consistently conservative assumptions, the staff has confidence that the actual transportation risks associated with the proposed PFSF will not be higher than those reported here. Based on the foregoing, the staff finds that annual and cumulative radiological impacts of transporting SNF to the proposed PFSF are small. Also, the results for the proposed PFSF are consistent with earlier analyses of SNF risks reported in NUREG-0170.

5.7.3 Mitigation Measures

The human health impacts from transportation of SNF would be small and, therefore, consideration of additional mitigation measures (i.e., beyond those required by existing shipping regulations or incorporated into the design of the shipping casks) is not warranted.

5.8 Other Impacts

5.8.1 Noise

5.8.1.1 Construction Impacts

Noise impacts would result from construction of a rail line or an ITF. Construction, excavation, and earthwork activities can generate noise levels up to 95 dB (EPA 1974, 1978) in the frequency range of human hearing [dB(A)]. This noise level applies at a reference distance of 15 m (50 ft) from the source. Noise levels decrease by about 6 dB(A) for each doubling of distance from the source, although further reduction occurs when the sound energy has traveled far enough to have been appreciably reduced by absorption into the atmosphere. Absorption depends strongly on the frequency of the sound. Typical absorption of low-frequency construction-related sounds is about 1 dB per km (1 dB per 0.6 mile) (Campanella 1992).

Construction of a new rail line could generate daytime noise levels of up to 95 dB(A) [at 15 m 50 ft) from the source for brief periods. At distances greater than about 3 km (2 mi), expected maximum noise levels from construction would be less than the 45 dB(A) recommended by EPA (1978) for protection against indoor activity interference and annoyance. Because of the remote location of the rail line, people other than construction workers are not likely to be within 3 km (2 mi) of those construction activities. When such activities would occur near Interstate 80 (such as for the Skunk Ridge rail siding or the ITF, they would not produce much additional noise for automobile passengers, as is verifiable from experience traveling near construction areas along major highways. For vehicle passengers traveling along Interstate 80, this noise would be difficult to distinguish from the background traffic noise [typically around 75 dB(A) for an automobile passenger (EPA 1978)] at distances of 200 m (650 ft) or more from the construction

5.8.1.2 Impacts During Operations

The loudest potential noise source associated with the operation of a delivery locomotive would be the train whistle. These whistles must be loud for safety reasons, and can reach levels of 120 dB at 15 m (50 ft). Train whistles are often audible at distances greater than 1.6 km (1 mile) during daytime hours, and would be audible at even greater distances where background levels are as low as in Skull Valley. However, at distances greater than 1 km, the absorption of sound energy by the atmosphere is no longer negligible, and noise decreases by more than 6 dB(A) for each doubling of distance from the source, especially in the higher frequencies corresponding to a whistle (Campanella 1992). Further, any train whistles that may sound (e.g., at grade crossings) would be in a sufficiently remote area that people other than transportation personnel would not be likely to be close enough to hear it. Routine locomotive operation would only occur during brief periods when transfer or movement of a shipping cask is taking place. Further, the trains involved would be moving slowly and would not be hauling boxcars, therefore their noise level would not be as great as a typical train [95 dB(A)], but would be closer to the 85 dB(A) level expected for a heavy-haul truck transporting a cask to the site.

Because of the remote location of the proposed rail line and the infrequent train traffic, noise impacts from construction and operation would be expected to be small.

5.8.1.3 ITF and Use of Skull Valley Road

PFS's ER indicates that noise levels could be as high as 85 dB(A) at a distance of 15 m (50 ft) from the roadway during brief periods when heavy-haul truck transportation of casks is in progress (PFS/ER 2000). This noise level, which would be expected to occur on average about 4 times per week, is about the same as conventional tractor-trailers at normal highway speeds using Skull Valley Road. Because the heavy-haul vehicle would operate on Skull Valley Road at reduced speeds, the duration of such noise for nearby residents would be greater than for other highway vehicles. However, noise during transportation of SNF would occur only during daytime hours, when it is least likely to be annoying. Therefore, noise would be noticeable, and could be distracting at times. The noise impacts from this activity are expected to be moderate in the vicinity of Skull Valley Road during periods when the heavy haul vehicles are passing, and would otherwise be small.

5.8.1.4 Alternative Site B

A new rail corridor to Site B would require a small percentage more construction than required for the preferred alternative because of the greater distance involved; a proportionally longer construction period would be expected. However, noise impacts from railway construction are expected to be small for rail access corridors to either Site A or Site B. If the selection of Site B would result in a more southerly location of the road from Skull Valley Road to that site, noise impacts could be appreciably greater than for Site A at the nearest residences.

Noise impacts from locomotives along the new access corridor or heavy-haul vehicles along Skull Valley Road would be the same for both Site A and Site B. If the road from Skull Valley Road to Site B is located further south than for Site A, noise impacts of operation at the nearest residences would also be greater at the nearest residences.

5.8.1.5 Mitigation Measures

Impacts can be mitigated by noise barriers, which are often costly and are not warranted based on the level of impact. Assurance that construction-related vehicles are equipped with state-of-the-art mufflers can be very effective in reducing some of the most annoying noises from construction vehicles.

Noise impacts from trains can be mitigated by noise barriers, which would be costly, would have negative aesthetic impacts, and could impede movements of animals along the right of way. Sound propagation varies strongly with frequency; low frequency sounds (e.g., a tuba) can be heard at much greater distance than can high frequency sound (e.g., a flute) of the same energy level. Adjusting the frequency of train whistles could greatly reduce noise effects at distances beyond 1 km (3,300 ft).

5.8.2 Scenic Qualities

Construction and operation of the proposed rail line and siding or ITF would change the scenic quality of Skull Valley. Construction would create the short-term visual impacts of additional dust from the operation of heavy equipment on-site and additional vehicle traffic on local roads. Construction of the rail line would also have long-term visual impacts because the line would represent a visual contrast in the undeveloped area between Interstate 80 and the proposed PFSF site. Operation of the rail line would create long-term visual impacts by introducing railroad traffic to the undeveloped area between Interstate 80 and the proposed PFSF site. Operation of the ITF would have the long-term visual impacts of increasing truck traffic on Skull Valley Road.

Changes in the scenic quality of the landscape due to construction and operation of the new rail line and siding would represent moderate impacts to recreational viewers, small to moderate impacts to residents of Skull Valley, and small impacts to motorists traveling on Interstate 80. The staff concludes that construction and operation of the ITF would represent small to moderate impacts to the same groups. The following discussion explains the staff's conclusions, which are based on an analysis similar to that described in Section 4.1.8.2.

5.8.2.1 Recreational Viewers

Recreationists in Skull Valley and in areas adjacent to the valley would be able to view the new rail line and siding and the ITF. Recreationists in the Cedar Mountains would be able to view the rail line and siding (see Figure 5.3), while recreationists in the Stansbury Mountains might be able to view the ITF. However, the ITF would be located in a more developed area (i.e., adjacent to Interstate 80) than most of the new rail line, and would have less significant visual impacts. For many recreationists, particularly those seeking wilderness experiences in the Cedar Mountains, the new rail line in the midst of the nearly undeveloped landscape south of Interstate 80 would represent a noticeable contrast and a moderate visual impact.

5.8.2.2 Local Residential Viewers

The new rail line could be visible to residents of the Goshute Village. However, the rail line is approximately 20 km (12 miles) from the village. For some members who live on the Reservation, the aesthetic impact of the new rail line could be considered large. The staff concludes aesthetic impacts of the new rail line on residents would likely be moderate because its visual presence would alter the scenic qualities of Skull Valley as viewed from residential areas.

Figure 5.3. Artist's rendering of the proposed Skunk Ridge rail line as viewed from the Cedar Mountains.

5.8.2.3 Motorists on Interstate 80

The new rail line and siding and the ITF would be highly visible to motorists on Interstate 80 (see Figures 5.4 and 5.5). However, it is likely that visual impacts to these motorists would be small because they would view the new facilities in the context of existing development along Interstate 80. For example, the portion of the new rail line that would be visible from Interstate 80 would be an extension of the existing rail network that parallels Interstate 80 west of Salt Lake City. Also, it is likely that many motorists on Interstate 80 would not be as sensitive to the visual changes as some recreationists and local residents. Thus, the staff concludes that the visual impact of the proposed rail line and siding or the ITF on motorists on Interstate 80 would be small because the visual presence of these facilities would neither alter noticeably nor destabilize the scenic qualities of Skull Valley as viewed from Interstate 80.

5.8.2.4 Mitigation Measures

To the extent that they are applicable, the measures discussed in Section 4.8.2 should be used to mitigate the visual impacts of the new rail line and siding or the ITF. PFS should consult with the BLM before planting any vegetation along the rail line to avoid creating a narrow, contrasting band of vegetation (i.e., a "green ribbon") through Skull Valley.

5.8.3 Recreation

Recreational uses of the land in Skull Valley include such activities as driving off-road vehicles, bird watching, and hiking. Direct and indirect impacts to recreational resources and opportunities during construction and operation of the new rail siding and corridor or the new ITF near Timpie and heavy-haul transport of SNF to the proposed site are expected to be small. The following paragraphs identify the potential for direct and indirect impacts associated with constructing each of these facilities, using these facilities to transport SNF to the proposed PFSF site, using these facilities to transport SNF to the Alternative Site B, and any mitigation measures that would reduce or ameliorate adverse impacts.

5.8.3.1 Construction Impacts

Direct impacts are primarily associated with any physical changes to those resources and opportunities that would result from construction of the transportation option. Indirect impacts are primarily associated with workers who might move into the area during construction of either of the local transportation options and who might place additional demands on existing resources and opportunities. As discussed in the following paragraphs, both direct and indirect impacts are expected to be small.

Activities associated with construction of the proposed rail line, including the movement of materials and workers to and from the rail head at Skunk Ridge and along the rail route, have the potential to affect recreational resources and opportunities. Impacts include the possible addition of obstacles (in the form of elevated roadbed) to existing unimproved roads ("jeep roads"), trails, or paths. Current unhindered access from Skull Valley to portions of the Cedar Mountains might be impaired at those locations where adequate rail crossings were not provided. The proposed rail route and alignment of

the rail line from Skunk Ridge does not intersect or cross the existing Cedar Mountain WSA in the northern portion of the Cedar Mountains. The route passes within approximately 800 m (0.5 mile) of BLM lands found to contain wilderness characteristics. Hastings Pass, a segment of the California Trail, a designated National Historic Trail, is the northern boundary of newly inventoried BLM lands determined to contain wilderness characteristics. Persons wishing to use recreational resources within the Cedar Mountains WSA or other areas in the Cedar Mountains may expect delays during construction of the rail line. These impacts are expected to be occur throughout the 14-month construction period. However, PFS's construction activities are expected to occur during the week and would not be expected to affect weekend use of the Cedar Mountain WSA or other nearby areas by recreational users.

Since demand on recreational resources varies directly with population, indirect impacts to recreational resources and opportunities are expected to be small due to the small amount of worker in-moving expected during construction of the proposed rail line. As indicated in Section 5.5, the number of in-moving workers is sufficiently small, even when added to any accompanying family members (approximately 0.3 percent of the Tooele County total population in 1996), that any increased demand placed by those workers and family members should not result in a noticeable effect on recreational resources and opportunities in the Cedar Mountains.

Activities associated with construction of the ITF near Timpie, including the movement of materials and workers to and from the construction site, have a very small potential to affect recreational resources and opportunities in the Skull Valley area. The location of the ITF, just off Interstate 80, would not affect recreational users' access to existing recreational resources and opportunities.

As with the proposed rail line, the indirect impacts are expected to be small due to the small workforce and any in-moving (approximately 0.1 percent of the Tooele County total population in 1996) associated with construction of the ITF (see Section 5.5).

5.8.3.2 Impacts During Operations

Direct and indirect impacts to recreational resources and opportunities during operation of the proposed rail line from Skunk Ridge to the proposed facility or the ITF and associated heavy-haul truck movement of SNF to the proposed facility are expected to be small. Activities associated with use of the rail line from Skunk Ridge to the proposed PFSF facility (i.e., two to four rail shipments per week over the life of the facility) would have minimal effect on recreational users of the Cedar Mountains and other areas on the western side of Skull Valley. Access to these areas over unimproved roads would not be curtailed during the operational period, except for the actual period of time it would take for a shipment to move past such an access road.

Indirect impacts to recreational resources and opportunities are expected to be small due to the small amount of worker in-moving expected during operation of the proposed rail line. The number of in-moving workers is sufficiently small, even when added to any accompanying family members, that any increased demand placed by those workers and family members should not result in a noticeable effect on recreational resources and opportunities in the Cedar Mountains.

Activities associated with operation of the ITF near Timpie, including the movement of heavy-haul trucks carrying SNF from the ITF down Skull Valley Road to the proposed facility, have a small potential to affect recreational resources and opportunities in the Skull Valley area. The location of the ITF, just off Interstate 80, would not affect recreational users' access to existing recreational resources and opportunities. However, persons wishing to use Skull Valley Road to access recreational resources such as Horseshoe Springs or the Deseret Peak Wilderness would need to expect delays during the movement of the slow-moving heavy-haul trucks, currently planned for two to four round trips per week for the life of the facility. PFS's use of Skull Valley Road is expected to occur during the week and would not be expected to affect weekend use of Skull Valley Road by recreational users.

As with the proposed rail line, the indirect impacts of using the ITF/heavy haul local transportation option are expected to be very small due to the small workforce (estimated at four workers) and any in-moving associated with operation of the ITF.

5.8.3.3 Alternative Site B

The alternative location (i.e., Site B) in Skull Valley for the proposed facility lies just south of the preferred site. Because Site B is very close to the preferred site, there would be no discernible differences in the anticipated impacts to recreational resources and opportunities during either construction or operation of either of the local transportation options.

5.8.3.4 Mitigation Measures

Given the small magnitude of the impacts to recreational resources and opportunities expected to result from construction and operation of either of the two local transportation options of the proposed facility, no mitigation measures were identified that would appreciably reduce the impact.

5.8.4 Wildfires

Operation of a rail line from Skunk Ridge could result in fires from equipment sparking, as has been reported to occur elsewhere in the west (AmeriScan 1999); however, approximately three fires already occur each year in Skull Valley. Table 5.17 shows the number of fires, and the size of land affected, that occurred in BLM's Salt Lake District between 1989 and 1998. The Salt Lake District includes Skull Valley.

As can be seen in Table 5.17 fires caused by lightning dominate the number of fires in the region, as well as the acreage affected by fires. Fires caused by railroads account for only 1.7 percent of the number of all fires and only 0.5 percent of all acreage affected by all fires. When only human-caused fires are considered, fires caused by railroads account for about 10 percent of those fires and about 1.3 percent of the acreage burned by human-caused fires.

PFS will own or lease and maintain the rail equipment used for delivery of SNF to the storage facility. This equipment will utilize the latest design innovations (train monitoring, breaking systems, etc.) to reduce the risk of wildfires due to rail transport. It is inherent in the design of rail equipment that sparks can be produced by the steel wheels of railroad trains in contact with the steel rails. Unlike cars and trucks, the axles on a train do not have differentials that permit the two wheels on one axle to rotate at different rates around curves. When a train moves around a curve, one of the wheels on the same axle slides along the rail to some extent, and this has a tendency to generate sparks.

Table 5.17. Number of fires and acres burned in BLM's Salt Lake District, 1989 through 1998

Cause of fire	Number of fires	BLM acres burned	Other acres burned	Acreage burned
Natural (lightning)	505	169,244	83,603	252,847
Human causes:				
Campfire	17	25	164	190
Smoking	8	1,270	287	1,557
Fire use	12	1,363	460	1,824
Incendiary	11	13,080	6,835	19,915
Equipment use	27	25,028	2,323	27,350
Railroads	15	607	1,359	1,966
Juveniles	2	11	0	11
Miscellaneous	53	67,319	28,833	96,152
Non-specific human-caused	1	0	0	0
Subtotal (all human caused)	146	108,704	40,261	148,965
Not classified	237	2,269	3,054	5,324
TOTAL	433	27,921	651	401,636

Notes:
(1) Data exclude false alarms.
(2) To convert acres to hectares, multiply the acreage by 0.405

Sparks can also be generated when the locomotive wheels slip while pulling a train uphill. There will be very few curves (no sharp curves) and no steep grades along the proposed Skunk Ridge rail corridor. Nevertheless, the possibility exists of sparks being produced by rail transport.

If a driver were to toss a lighted cigarette out the window of the vehicle, it is possible that a wildlife could start. This could occur whether the vehicle is a heavy haul truck or train, with similar likelihoods of starting a fire. Since trains can produce sparks from the metal rails, a condition that does not exist with the heavy haul option, it is considered that rail transport would have a slightly higher probability of causing wildfires than heavy haul truck transport. However, as noted above, the Skunk Ridge rail corridor with its minimum number of curves, no steep grades, and use of the latest equipment design innovations will minimize the risk of sparks that could lead to wildfires.

Because there is no evidence that the proposed rail line from Skunk Ridge would be more prone to cause fires than other railroad operations in BLM's Salt Lake District, it is concluded that the presence of the new rail line would not add significantly to the existing risk of fire in Skull Valley.

However, fires occurring on BLM land are investigated and a report is generated describing the cause of the fire. If it is determined that the rail line operation is the cause of the fire, PFS would be obligated to pay for the cost of suppression.

If post-construction revegetation of the rail corridor follows BLM's fire management plan for Skull Valley (see BLM 1998c), it would be possible for the rail corridor to function as a green strip to help prevent the spread of both wildfires and those caused by operation of the rail line. Revegetation is discussed in detail in Section 5.4. The planting of species that both retard fires and also rehabilitate some of the areas where invasive annuals are currently growing could benefit vegetation by increasing biodiversity and improving local ecosystems.

The presence of the new rail line could also interfere with efforts to fight wildfires in Skull Valley. The elevated railbed could limit access across Skull Valley in an east-west direction and may impede the progress of fire-fighting personnel and equipment. The proposed rail line would include several rail crossings that could minimize the potential for the elevated railbed to adversely impact fire-fighting efforts.

5.8.4.1 Mitigation Measures

To mitigate potential impacts to fire fighting efforts, PFS should consult with BLM to determine the correct frequency of rail crossings. The cooperating agencies recommend that this mitigation measure be required (see Section 9.4.2). The potential for fire resulting from rail line operations could be further reduced by the use of modern rail equipment and good maintenance.

5.9 Decommissioning

Decommissioning activities are described in Section 2.1.6; however, the actual actions taken to decommission the transportation corridor cannot be predicted at this time. If the decommissioning of the rail corridor or ITF is elected then the impacts similar to those described in the following paragraphs could occur.

5.9.1 Skunk Ridge Rail Line Corridor

Upon expiration of the right-of-way, the rail line would be removed and reclaimed in accordance with the Plan of Development and right-of-way grant from the BLM. This plan calls for the rail and ballast to be removed and the remainder of the grade to be recontoured and reseeded. PFS would also need to file an application for abandonment authority with the STB. The potential environmental impacts of abandoning the rail corridor would be addressed by further NEPA documentation at that time; however, it is expected that the types of impacts that would accompany the removal of the Skunk Ridge rail siding and rail corridor would be similar to or less than those associated with the construction of those facilities. These impacts have been determined to be small to moderate (see Sections 5.1 through 5.8). The rail bed ballast and subballast would be removed and recovered for future reuse. The steel rails could be removed and reused or recycled as scrap metal. Revegetation would occur in a manner similar to that for decommissioning and closing the proposed PFSF (see Section 4.9).

5.9.2 New ITF Near Timpie

Under the alternative of constructing and operating an ITF near Timpie, the current decommissioning plans call for the ITF to be dismantled and removed upon closure of the proposed PFSF and the area recontoured and revegetated with appropriate native plant species (see the discussion of revegetation in Section 4.9). The types of impacts that would accompany the removal of the ITF would be similar to those discussed in Sections 5.1 through 5.8 for the construction of the facility. These impacts have been determined to be small.

The rail bed ballast and subballast from the rail sidings at the ITF would be removed and recovered for future use. The steel rails could be removed and recycled as scrap metal. The foundations of the building, the loop road, and the access road would be demolished and converted into solid waste that would be sent to an appropriate landfill for disposal.

5.9.3 Potential Worker Injuries During Decommissioning

The proposed rail line may be left in place for future uses. However, should the rail line be decommissioned, the staff has assumed that it would take the same amount of time and number of workers to complete the decommissioning activities as it would be originally to construct the rail line. Thus, the estimates above for construction of the rail line can be applied to decommissioning (see Table 5.4). Using this same line of reasoning, the estimates above for the construction of the ITF can also be applied to its decommissioning.